RESERVE

VOL. CLVIII, No. 4 OCTOBER, 1919 No. 571

ESTABLISHED 1820

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES

GEORGE MORRIS PIERSOL, M.D., EDITOR
JOHN H. MUSSER, JR., M.D., ASSOCIATE EDITOR

JUN 8 194

THE CARDIAC PHASE OF THE WAR NEUROSES. By ALFRED E. COHN, M.D. . . [illegible]

A LONG DURATION OF REMISSION IN PERNICIOUS ANEMIA. By CHARLES C. STOCKTON, M.D. 471

MENINGOCOCCUS ARTHRITIS. By W. W. HERRICK, M.D., and G. M. PARKHURST, M.D. . 473

CONCERNING ASCENDING RENAL TUBERCULOSIS. By LEO BUERGER, M.D., F.A.C.S. . 482

EFFECTS OF THE INJECTION OF ATROPIN ON THE PULSE-RATE, BLOOD-PRESSURE AND BASAL METABOLISM IN CASES OF "EFFORT SYNDROME." By CYRUS C. STURGIS, First Lieut., M.C., U.S.A., JOSEPH T. WEARN, M.D., First Lieut., M.C., U.S.A., and EDNA H. TOMPKINS 496

POINTS OF DIFFERENTIAL DIAGNOSTIC VALUE IN PULMONARY ABSCESS, BRONCHIECTASIS AND PULMONARY TUBERCULOSIS, WITH AN EXPLANATION OF THE CAUSE OF THE DIFFERENCE IN AUSCULTATORY FINDINGS. By FRANCIS MARION POTTENGER, A.M., M.D., LL.D. 502

IMMINENT PYSCHOLOGY: A PROPHECY AND A PLEA. By JOSEPH COLLINS, M.D. . 510

BRONCHIECTASIS: ITS DIFFERENTIATION FROM PULMONARY TUBERCULOSIS. By B. STIVELMAN, M.D. 516

A CASE OF ENLARGED THYMUS GLAND AND SOME REMARKS ON STATUS LYMPHATICUS. By RICHARD COLE NEWTON, M.D 534

TRANSITIONAL LEUKOCYTOSIS AND ITS DIAGNOSTIC VALUE IN CHRONIC APPENDICITIS. By G. A. FRIEDMAN, M.D. 545

CASE OF MEDIASTINAL HODGKIN'S GRANULOMA, WITH PERFORATION OF THE CHEST WALL. By M. W. LYON, JR., M.D. 557

FIELD OBSERVATIONS ON BLOOD-VOLUME IN WOUND HEMORRHAGE AND SHOCK. By ROGER I. LEE, M.D., Lately Lieut.-Col., M.C. 570

CYTOLOGICAL STUDIES OF PLEURAL EXUDATES COMPLICATING INFLUENZA. By BALDUIN LUCKE, M.D., Dr.P.H., First Lieut., M.C., U.S.A., and RUTH BARKER, A.B., Technician, U.S.A. 577

(Contents continued on page vi)

COLLEGE OF PHYSICIANS LIBRARY OCT 18 1919 OF PHILADELPHIA

OWNERS AND PUBLISHERS
Philadelphia LEA & FEBIGER New York

COPYRIGHT, 1919, BY LEA & FEBIGER. ALL RIGHTS RESERVED. ENTERED AT THE POST-OFFICE AT PHILADELPHIA AS SECOND-CLASS MATTER

PUBLISHED MONTHLY. SUBSCRIPTION, FIVE DOLLARS A YEAR, POSTPAID

Influenza Prophylaxis

A VACCINE prepared from the bacteria which were found to be the chief infecting agents of influenzal pneumonia should afford the greatest degree of protection against influenza and its complications.

All the cultures used in the preparation of **Influenza Prophylactic** *Lederle* were isolated from cases of influenza in the recent pandemic. They include the influenza bacillus of Pfeiffer; the four types of Streptococcus hemolyticus as classified by Dochez, Avery and Lancefield; the Rosenow strain of Streptococcus viridans, and the Mathers coccus and other green-producing streptococci isolated at Camp Meade; also the three fixed types of pneumococci as originally classified by Cole.

The complete prophylactic treatment consists of three doses injected subcutaneously. The interval between injections is preferably five days, but shorter or longer periods may be used.

	1st Dose	*2d and 3d Doses*
B. influenzæ	500 Million	1000 Million
Streptococcus hemolyticus	500 "	1000 "
Streptococcus viridans	500 "	1000 "
Pneumococcus Type I	1000 "	2000 "
Pneumococcus Type II	1000 "	2000 "
Pneumococcus Type III	500 "	1000 "

PACKAGES

		Code
8 Immunizations in 20 cc vial	$3.50	RAY
2 Immunizations in 5 cc vial	1.00	REAL
1 Immunization in three vials	1.00	REEK
1 Immunization in three syringes	2.25	RANGE

Booklet upon request.

Lederle Antitoxin Laboratories

511 Fifth Ave., New York City

Chicago Kansas City New Orleans San Francisco
Montreal Winnipeg Buenos Aires

R

In

T

ventiv

Th

and cl

Th

at last

INF

bio

bacill

light

plicat

sively

use i

cine

colds

short

E

Respiratory Infections

VACCINE THERAPY
PROPHYLACTIC and THERAPEUTIC

Influenza, Influenzal-Pneumonia, Nasal and Bronchial Catarrhs, Common and Epidemic Colds

---

CATARRHAL VACCINE, COMBINED, LILLY

THIS vaccine, composed of the organisms commonly found associated in the ordinary respiratory infections: Friedlander bacilli, micrococci catarrhalis, pneumococci, streptococci and staphylococci, has proved of value for the preventive inoculation of individuals subject to common colds.

The usefulness of Catarrhal Vaccine, Combined, in the treatment of the subacute and chronic catarrhs has also been amply demonstrated during the past few years.

The success which attends the efforts along these new lines, holds out the hope that at last there is a dependable rational method of preventing and treating these infections.

INFLUENZA MIXED VACCINE, LILLY

INFLUENZA is said not to be merely a mixed infection, but a "malignant symbiosis" of a probable unknown factor and the usual respiratory flora: influenza bacilli, micrococci catarrhalis, pneumococci, streptococci and staphylococci. In the light of our newly acquired knowledge, a vaccine composed of these organisms is applicable both for prophylaxis and treatment of this malady. This vaccine was extensively used during the epidemic with a degree of satisfaction which warrants its further use in the event of recurrences of influenza, which have been predicted. The vaccine is also adapted for the preventive inoculation of persons suffering from recurring colds, especially of the epidemic type, and as an efficient means of aborting or cutting short the course of the infections, once it is established.

The immunity conferred by prophylactic inoculations of the above vaccines is of limited duration. Because of this fact, it is advisable to vaccinate twice a year, once in the early fall and once again in the spring.

WRITE FOR FURTHER INFORMATION

The Vaccines are supplied through the Drug Trade in convenient ampoule vial and syringe packages

ELI LILLY & COMPANY

INDIANAPOLIS, U. S. A.

All Food Cells Exploded

Puffed Grains are Prof. A. P. Anderson's scientific foods.

The grains are sealed in guns, then rolled for an hour in 550 degrees of heat. Thus the moisture in each food cell is changed to steam.

Then the guns are shot. Over 100 million steam explosions occur in every kernel. All the food cells are blasted. The grains are puffed to bubbles eight times normal size.

The result is whole wheat, whole rice and corn hearts supremely fitted for digestion.

The Quaker Oats Company

Chicago

Puffed Wheat
Puffed Rice
Corn Puffs

A New Work

Experimental Pharmacology

BY

HUGH McGUIGAN, PhD., M.D.

Professor of Pharmacology, University of Illinois, College of Medicine, Chicago

Octavo, 251 pages with 56 engravings and 7 colored plates (mostly original)
Cloth, $2.75, net

THIS manual presents experimental pharmacology in a brief, concise form but gives an adequate view of the field. It follows and illustrates the most important part of the text-book work. Sufficient experiments are given to demonstrate the chief actions of each drug. The introduction discusses Mode of Pharmacological Action, Results of Drug Action, Chemical Composition, Conditions Modifying Effects of Drugs, Technic, Anesthesia, Insufflation, etc. There are chapters on Administering Drugs; Antiseptics and Disinfectants; Closed Method of Anesthesia; Action of Strychnin, Picrotoxin and Curara on Central Nervous System; Paralysis of Motor Nerve Endings; Autonomic System and Autonomic Drugs; Antagonism; Antipyretics; General Protoplasm Poisons; and on PHARMACOLOGY of—Gastro-Intestinal Tract—of Cranial Nerves—of Heart and Blood Pressure—of Sensory Nerve Ends—the Eye—the Glands—the Kidneys—Sweat Glands—Liver, Mammary Glands, Uterus and Bladder—the Muscles—the Lymphatics—of the Blood, etc.

LEA & FEBIGER

PHILADELPHIA
706-8-10 Sansom Street

NEW YORK
2 West 45th Street

DOCTOR, Have You Patients Convalescing from Spanish Influenza or Pneumonia?

And are you puzzling your head this very moment for the right place to send them?

—where they will find the badly needed change of air and scene in a thoroughly delightful climate.

—where they will be assured of purest water and proper food, supplemented, if necessary, by special treatments.

—where they will be surrounded with opportunities for healthful diversion and recreation.

—and where there is no long hard and incidentally expensive journey to tax their strength.

There is just such a place. With all these advantages. It is—

OLD POINT COMFORT

Virginia

Hotel Chamberlin

At the Greatest Center of Military, Naval and Aërial Activity in America. Delightful walks and drives. Dancing, Golf, Tennis, Sea Bathing every day of the year. A complete Electro-Hydro-therapeutic outfit. Sea Foods, Southern Cookery.

For further or any special information, write our Resident Medical Director,

DR. DONALD W. STEWART

Hotel Chamberlin **Fortress Monroe, Va.**

For Hotel Rates, Reservations, etc., address
Geo. F. Adams, Mgr., Fortress Monroe, Va.

VIRGINIA HOT SPRINGS

Open All Year Round

ITS waters are rich in minerals of highest medicinal value—radioactive, and have a natural temperature of 106 degrees. The Homestead's "cure" offers every kind of scientific bath and hydrotherapeutic treatment. Massage, Swedish gymnastics, and corrective exercises for every disorder. Eminently successful in treating rheumatism, gout, obesity, eczema, and all forms of nervous and digestive complaints.

THE Homestead nestles in the heart of the Alleghany mountains, 2500 feet above sea level. Climate mild and invigorating the year round. The ideal resort for relaxation and the building up of sick or tired bodies. Every facility for sport outdoors and every comfort and convenience within. Service and cuisine unexcelled.

Brochures and detailed information on request

THE HOMESTEAD

CHRISTIAN S. ANDERSEN
Resident Manager

Hot Springs, Va.

Better Than Ever

A NEW EDITION OF

Technical Publication

No. 10

(*Just from our printers*)

Revised and brought thoroughly up-to-date, this booklet contains an interesting discussion of

DAKIN'S SOLUTION

together with plates and full data regarding its manufacture from Liquid Chlorine with

"W & T" DAKIN'S SOLUTION APPARATUS

Adopted as the Standard Equipment of the Army Medical Department

COPY SENT FREE UPON REQUEST

Wallace & Tiernan Co., Inc.

349 Broadway, New York City

Concerning Carminzym

Its Success

"It is a combination that ought to do good work" is the frequent comment.

And now Carminzym holds the interest of the physician because he has found that ***it does the work;*** that it gives relief to the patient; that it is a clinical success in those attacks of flatulent, acid indigestion against which Carminzym is especially designed.

Samples and particulars upon request.

Fairchild Bros. & Foster
New York

"CINCHOPHEN" Formerly **"ATOPHAN"**

"'Cinchophen' has been selected as the designation for the substance introduced as 'atophan' (also described in the U. S. Pharmacopœia under 'phenylcinchoninic acid'). In consideration of this action on the part of the Chemical Foundation, and also because physicians found it difficult to use the pharmacopœial name 'phenylcinchoninic acid,' the Council on Pharmacy and Chemistry has recognized the contracted term 'cinchophen' as a name for the drug introduced as 'Atophan.' It is hoped that physicians will support this simplified and nonproprietary nomenclature in the same spirit with which they adopted the terms 'arsphenamin,' 'barbital' and procain.'" — *Journal of the American Medical Association*, August 9th, 1919, page 427.

Calco

CINCHOPHEN CALCO

(Phenylcinchoninic Acid, U. S. P.)

The efficient therapeutic agent in

GOUT	NEURALGIA
RHEUMATISM	NEURITIS
ARTHRITIS	SCIATICA

MIGRAINE

A Safe and Powerful Analgesic Antipyretic and Uric Acid Eliminant

DOES NOT IRRITATE THE KIDNEYS—DOES NOT DEPRESS THE HEART

For general use in painful joint and muscle conditions, and wherever there is congestion

If your druggist does not keep in stock CINCHOPHEN CALCO, order direct

THE CALCO CHEMICAL COMPANY

PHARMACEUTICAL DIVISION

136 Liberty Street, NEW YORK CITY

CONTENTS

ORIGINAL ARTICLES

The Cardiac Phase of the War Neuroses 453

By ALFRED E. COHN, M.D., New York.

A Long Duration of Remission in Pernicious Anemia 471

By CHARLES G. STOCKTON, M.D., Buffalo, N. Y.

Meningococcus Arthritis 473

By W. W. HERRICK, M.D., Assistant Professor of Medicine, College of Physicians and Surgeons, Columbia University, New York City, and G. M. PARKHURST, M.D., New York City.

Concerning Ascending Renal Tuberculosis 482

By LEO BUERGER, M.D., F.A.C.S., New York.

Effects of the Injection of Atropin on the Pulse-rate, Blood-pressure and Basal Metabolism in Cases of "Effort Syndrome" 496

By CYRUS C. STURGIS, First Lieut., M.C., U.S.A., Pendleton, Oregon; JOSEPH T. WEARN, M.D., First Lieut., M.C., U.S.A., Charlotte, N. C., and EDNA H. TOMPKINS, Cambridge, Mass.

Points of Differential Diagnostic Value in Pulmonary Abscess, Bronchiectasis and Pulmonary Tuberculosis, with an Explanation of the Cause of the Difference in Auscultatory Findings 502

By FRANCIS MARION POTTENGER, A.M., M.D., LL.D., Monrovia, California.

(Contents continued on page 8)

Radium Laboratories of New York, Inc.

Successors to **Radium Institute** *Founded by Dr. Joseph B. Bissell in 1914*

205 West 70th Street, New York City

ADEQUATE AMOUNTS OF RADIUM TO MEET ALL DOSAGE REQUIREMENTS
BENIGN GROWTHS BIRTH MARKS KELOID FORMATIONS INOPERABLE CANCER
POSTOPERATIVE RADIATION TUBERCULOUS GLANDS

Intravenous injections of Radium Chloride are available for rheumatoid arthritis, arteriosclerosis, and for manifestations of the senile period. Radio-active waters furnished in any mache unit dosage

Post-graduate courses in Radium Therapy will be inaugurated in October
Detailed information on application

C. EVERETT FIELD, M.D., *Medical Director* **ROBERT P. WADHAMS, M.D.,** *Surgical Director*

The Victor
Model "New Universal" Roentgen Apparatus

This is the Victor apparatus that was selected for the Cantonment Hospitals of the U. S. Army. The wonderful record it established in Military Service, as regards durability and consistent operation, has influenced many "returned" physicians to make it their choice.

The "New Universal" represents the ideal moderate investment, where it is desired that the range of service cover entirely the fields of radiography, fluoroscopy and roentgenotherapy.

Details in Bulletin 217—sent on request

VICTOR ELECTRIC CORPORATION

Manufacturers of a Complete Line of Roentgen and Electro-Medical Apparatus

CHICAGO
236 S. ROBEY ST.

CAMBRIDGE, MASS.
66 BROADWAY

NEW YORK
131 E. 23d ST.

Sales and Service Stations:

NEW YORK, N. Y.
131 E. 23d St.
CAMBRIDGE, MASS.
66 Broadway
CHICAGO, ILL.
30 E. Randolph St.
236 S. Robey St.
PHILADELPHIA, PA.
25 S. 17th St.
SEATTLE, WASH.
823 White Bldg.
PORTLAND, ORE.
828-831 Morgan Bldg.
KANSAS CITY, MO.
414 E. 10th St.
BIRMINGHAM, ALA.
619 Brown-Marx Bldg.

DETROIT, MICH.
103 Broadway
CINCINNATI, OHIO
1021 Union Central Bldg.
LOUISVILLE, KY.
433 Atherton Bldg.
NEW ORLEANS, LA.
Maison Blanche Annex
LOS ANGELES, CAL.
930 Hill St.
MINNEAPOLIS MINN
220 La Salle Bldg.
DENVER, COLO.
809-10 Majestic Bldg.
AUSTIN, TEXAS
708 Colorado St.
TORONTO, CANADA
24 Hayter St.

PITTSBURGH, PA.
620 Fulton Bldg.
FT. WAYNE, IND.
1333 Calhoun St.
DES MOINES, IOWA
518-22 Utica Bldg.
WINNIPEG, CANADA
Keewayden Block
VANCOUVER, CANADA
536 Smythe St.
SAN FRANCISCO, CAL.
334 Sutter St.
BUFFALO, N. Y.
318 Pearl St.
ATLANTA, GA.
515 Hurt Bldg.
CHATTANOOGA, TENN.

Imminent Psychology: A Prophecy and a Plea 510

By Joseph Collins, M.D., Physician to the Neurological Institute, New York.

Bronchiectasis: Its Differentiation from Pulmonary Tuberculosis . . 516

By B. Stivelman, M.D., Medical Superintendent, Montefiore Home Country Sanatorium, Bedford Hills, N. Y.

A Case of Enlarged Thymus Gland and Some Remarks on Status Lymphaticus 534

By Richard Cole Newton, M.D., Consulting Physician to the Mountainside Hospital, Montclair, N. J.

Transitional Leukocytosis and its Diagnostic Value in Chronic Appendicitis 545

By G. A. Friedman, M.D., Clinical Professor of Medicine, New York Polyclinic Medical School and Hospital; Visiting Physician, Beth David Hospital; Attending Physician in Digestive Diseases, Vanderbilt Clinic; Gastro-enterologist, Gouverneur Hospital, New York.

Case of Mediastinal Hodgkin's Granuloma, with Perforation of the Chest Wall 557

By M. W. Lyon, Jr., M.D., South Bend, Indiana.

Field Observations on Blood-volume in Wound Hemorrhage and Shock 570

By Roger I. Lee, M.D., Lately Lieut.-Col., M.C., Cambridge, Mass.

Cytological Studies of Pleural Exudates Complicating Influenza . . . 577

By Balduin Lucke, M.D., Dr.P.H., First Lieut., M.C., U.S.A., Philadelphia, and Ruth Barker, A.B., Technician, U.S.A., St. Louis.

REVIEWS

Roentgen Interpretation. A Manual for Students and Practitioners. By George W. Holmes, M.D., and Howard E. Ruggles, M.D. . . 581

Urology. By V. C. Pedersen, M.D. 582

Pulmonary Tuberculosis. By Maurice Fishberg, M.D. 583

(*Contents continued on page 10*)

CLINICAL LABORATORY ANALYSES

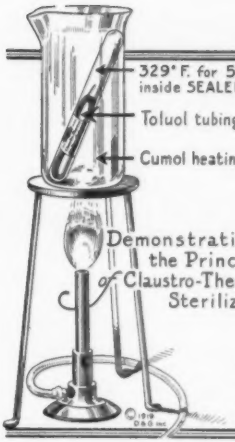
DEPARTMENTS for SEROLOGY, CHEMISTRY, PATHOLOGY BACTERIOLOGY, SANITATION

ABSOLUTELY ACCURATE TECHNIQUE

LABORATORY OF PATHOLOGY AND BACTERIOLOGY

1130 Marshall Field Annex Building, 25 East Washington Street, CHICAGO

FEE TABLE AND STERILE CONTAINERS ON REQUEST



100% Sterility throughout the war

Millions of Sutures supplied to U. S. Army and Navy without a single rejection for any cause.

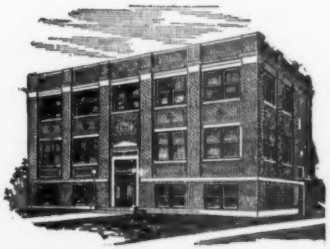
This unequalled record was attained through the Claustro-Thermal method of heat sterilization

DAVIS & GECK, Inc.
Suture Specialists
217-221 Duffield Street - BROOKLYN-NY

USE SHERMAN'S Bacterial Vaccines

To PROTECT YOUR PATIENTS against

Colds - Pneumonia - Influenza



Write for Literature

DAILY USERS OF VACCINES USE SHERMAN'S

G. H. SHERMAN, M. D.
Detroit, Mich. U.S.A.

Mortality Statistics of Insured Wage-earners and Their Families. By Louis I. Dublin 584
Gynoplastic Technology. By Arnold Sturmdorf, M.D. 585
Geriatrics: A Treatise on Senile Conditions, Diseases of Advanced Life and Care of the Aged. By Malford W. Thewlis, M.D. 586
Cerebrospinal Fever. By C. Worster-Drought, M.D., and Alexander Mills Kennedy, M.D. 587

PROGRESS OF MEDICAL SCIENCE

MEDICINE

UNDER THE CHARGE OF

W. S. THAYER, M.D., ROGER S. MORRIS, M.D., AND THOMAS ORDWAY, M.D.

On the Clinical Evidence of Involvement of the Suprarenal Glands in Influenza and Influenzal Pneumonia 588
The Uric Acid Content of the Blood Compared with the Renal Dietary Test 589
A Plea for the Early Administration of Atropin in Pneumonia . . . 590
Chronic Amebic Dysentery and Emetin-and-Bismuth Iodide 590

SURGERY

UNDER THE CHARGE OF

T. TURNER THOMAS, M.D.

Resection of the Cecum and Ascending Colon 590
Studies in the Standardization of the Wassermann Reaction 591
Criteria as to Cure in Syphilis 592
Cancer of the Tongue (Bradshaw Lecture) 592
A Study of Peripheral Nerve Injuries 593
An Unusual Type of Fracture-Dislocation of the Upper End of the Humerus 593

(*Contents continued on page 12*)

PHILADELPHIA CLINICAL LABORATORY, Inc.

E. Q. ST. JOHN, M.D., President

PROFESSIONAL BUILDING, 1833 CHESTNUT STREET, PHILADELPHIA

General Clinical, Bacteriological and Sanitary Analyses.
Autogenous vaccines, Wassermann reactions, Gonococci fixation, Standardization of disinfectants, Analyses of drinking water, milk and foods. Examination of blood including chemical analysis. Histological examination of tissue.
Research work in biological chemistry and bacteriology.
Abstracts and translations from French, German, Italian and Spanish.

Reports of analysis given only to the physician in charge of the case.

Arlco Epidermal Proteins

For Diagnosis

Bronchial Asthma due to a sensitivity to one or more of the various animal epidermal proteins may now be located by cutaneous test, with Arlco-Epidermal Proteins, for diagnosis.

This whether the condition be caused by the proteins of the dandruff and hair of such domestic animals as the horse, cat or dog, or those of feathers—for example chicken or goose.

Animal Epidermal Extracts

For Treatment

Specific desensitization with resultant relief from asthma can also be secured through our standardized treatment sets of the different epidermal protein extracts.

For Literature Address

The Arlington Chemical Company
YONKERS, NEW YORK

Bloodpressure

A Diagnostic Symptom of Paramount Importance, but the Subject of Endless Doubt and Discussion—

Why?

THE study of Bloodpressure begins with the instrument. In the measurement of weight and pressure, **Gravitation** is the only True Principle. Chemists, Jewelers, Pharmacists—always use a **Gravity** scale,—synonymous with Permanent Accuracy and Reliability.

Wherever its Merit is known, Progressive Physicians are using the

Baumanometer
The Super-sphyg

A precision Gravity-Gauge for Bloodpressure, built on a scientifically Sound Principle, extremely simple in design and so definitely superior that, of thousands in use, over 90% have *replaced* other, current types of instruments.

You will be interested in the **Baumanometer**, not especially as a *new* sphygmo-manometer, but because it is *different*, and represents a departure from the endless repetition that has characterized this class of instruments to date.

Informative literature upon request. Write for it today.

SOME
REPRESENTATIVE
PURCHASERS

Barker, Lewellys F., M. D., Baltimore, Md.
Christian, Henry A., M. D.
Peter Bent Brigham Hospital, Boston.
Hare, Hobart, Phila., Pa.
Janeway, Theodore C., M. D. (Deceased)
Johns Hopkins Hospital, Baltimore, Md.
Lambert, Alexander, M. D., New York
U. S. Government (Various Branches)
Rockefeller Institute for Medical Research
Columbia University
Harvard University
Johns Hopkins University
Yale University
Carnegie Steel Company
Remington Arms Company
Metropolitan Life Insurance Company
Has purchased over 1,000
Mutual Life Insurance Company
New York Life Insurance Company

W. A. Baum Co. Inc.
Scientific Apparatus
100 Fifth Avenue
New York

PEDIATRICS

UNDER THE CHARGE OF

THOMPSON S. WESTCOTT, M.D., AND ALVIN E. SIEGEL, M.D.

Duodenal Stenosis 594
Malnutrition in Children: A Study of the Examination of Nine Hundred Children under Eight Years of Age 595
The Organization and Methods of Contagious Disease Service . . . 595
Fat Metabolism of Infants and Young Children: III—Fat in the Stools of Children on a Mixed Diet 597
The Constipating Qualities of Orange-juice 598
The Shick Reaction and its Practical Application 598

OBSTETRICS

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.

The Injection of Fluid into the Placenta to Aid in the Separation . . 599
Retention of Urea in Kidney Disease 600
The Continued High Maternal Mortality of Childbirth 600
The Transmission of Malaria through the Placenta 600
Tuberculosis of Pregnancy 601
Postpartum Shock 601

(*Contents continued on page 14*)

RADIUM

STANDARD CHEMICAL CO.

CLINICAL data clearly prove the effectiveness of Radium in certain benign and malignant growths.

Sold on basis of U. S. Bureau of Standards measurement.

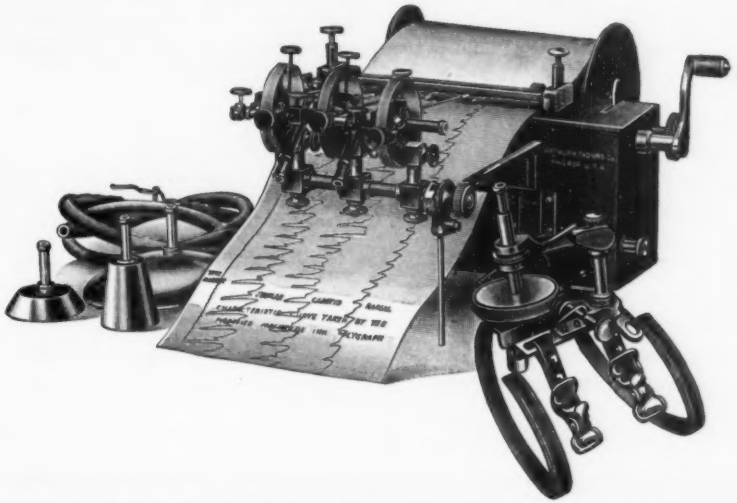
Departments of Physics and Medicine for Instruction in the physics and therapeutic application of Radium.

Information as to dosage, technic and equipment upon request.

RADIUM CHEMICAL CO.

Mackenzie Ink Polygraph

NEW AMERICAN MODEL



The Mackenzie Ink Polygraph consists of the following parts: The casing containing the paper rolling and time-marker movements, the writing tambours with supporting bar, wrist tambour with attachment for strapping to wrist, paper roll bracket and pens and time marking pen.

The casing contains the driving mechanism, with a spring movement, which permits the paper feed rollers to be rotated at various speeds. The aluminum writing pen, or time-marker, vibrates at a constant speed of 300 per minute, which is equivalent to one-fifth of a second.

The receiving tambour for radial pulse consists of two parts, the splint for strapping on the wrist, and the tambour supporting arm. The splint is provided with a spring tongue and button which rises and falls with the action of the pulse. The tambour is also provided with a button and micrometer screw adjustment for increasing or decreasing the pressure on the lower button. The stem of the tambour is threaded and by means of the knurled thumb screw, the adjustment between the two buttons can be very accurately made, thus ensuring a large excursion of the membrane and consequent air vibration in the tube leading to the writing tambour's pen.

43090. **Mackenzie Ink Polygraph, New American Model,** for simultaneously recording three ink tracings, *i. e.*, radial and two others, *i. e.*, carotid, jugular, apex beat or respiration, in addition to a time tracing in one-fifth second. Complete outfit as shown in illustration . . . **$250.00**

In our stock for immediate shipment

WHOLESALE AND EXPORT DISTRIBUTORS

ARTHUR H. THOMAS COMPANY

IMPORTERS—DEALERS—EXPORTERS

LABORATORY APPARATUS AND REAGENTS

WEST WASHINGTON SQUARE **PHILADELPHIA, U. S. A.**

Abdominal and Vaginal Section in Cases Complicated with Infection . 602
The Problem of the Cystocele 602
A Method of Demonstrating with the Hands the Mechanism of Labor and the Various Types of Pelves 602
Reconstruction of the Uterus 602
An Analysis of 304 Cases of Ectopic Gestation 603
Cesarean Section under Unusual Conditions 603

GYNECOLOGY

UNDER THE CHARGE OF

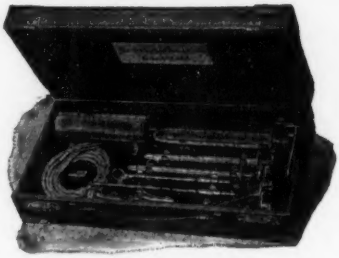
JOHN G. CLARK, M.D., AND FRANK B. BLOCK, M.D.

Coexistent Disease of the Appendix and Pelvic Organs 604
Chronic Endometritis 605
Radium in Genital Cancer 606
A Study of Bladder Function 607

ACCURATE DIAGNOSIS MADE POSSIBLE

Certainty

of diagnosis—accuracy of treatment—both are facilitated by the use of electrically lighted instruments, which give an actual view of the parts. E. S. I. Co. instruments are made according to the ideas of leading physicians and surgeons, as for example: **Holmes, Jackson, Tuttle, Lynch, Braasch, Koch, Swineburn and Young,** and include Nasoscopes, Proctoscopes, Sigmoidoscopes, Cystoscopes and many others. All are fitted with superior lamps. Brilliant illumination at trifling cost.



Modern General Diagnostic Outfit

This outfit now weighs but 4½ pounds, and measures 3½ x 7 x 15 inches, making it very convenient to carry.

All E. S. I. Co. instruments are warranted mechanically and electrically perfect.

Illustrated and descriptive catalog sent on request. Be sure of exact name.

ELECTRO SURGICAL INSTRUMENT CO.

ROCHESTER, N. Y.

Atophan

A
Sign of the Times

Time there was when the medicinal treatment of ***Gout,*** meant Colchicum, of ***Rheumatism*** the Salicylates, of ***Pain, Inflammation*** and ***Congestion,*** Acetanilid and the numerous coal tar derivatives which followed it.

Intestinal irritant, heart depressant, constipating and cumulative drugs.

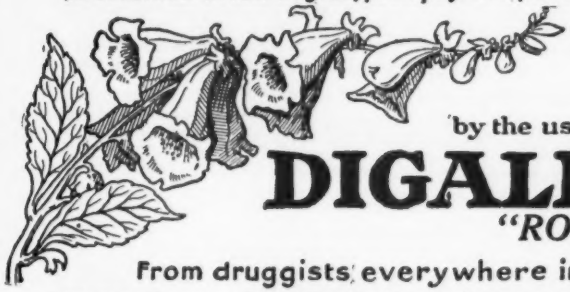
Now-a-days it's ATOPHAN with ***quicker, better*** results, ***safely*** obtained.

LITERATURE AND INFORMATION FROM

SCHERING & GLATZ, Inc., 150 Maiden Lane, NEW YORK

DIGITALIS MEDICATION ORALLY-INTRAVENOUSLY OR INTRAMUSCULARLY

is obtained in full degree, promptly and potently



by the use of

DIGALEN

"ROCHE"

From druggists everywhere in

VIALS AMPULS TABLETS

and **HYPODERMIC TABLETS.**

Free Trial Supply and Literature from THE HOFFMANN-LA ROCHE CHEMICAL WORKS — NEW YORK

Fight the Pneumonias

Mulford Antipneumococcic Serums

(Polyvalent and Monovalent, Type I), as used so successfully in the U. S. Army and Navy, are invaluable in the treatment of pneumococcus pneumonias.

The Mulford polyvalent serum is fully equivalent to the monovalent serum in its protective power against Type I infections, and, in addition, contains protective antibodies against Types II and III.

It is considered advisable to administer polyvalent serum promptly in all cases of pneumonia where it is impossible to obtain immediate type diagnosis.

Mulford Antistreptococcic Serum

may be used to advantage conjointly with Antipneumococcic Serum for treating that large number of lobar pneumonias in which the streptococcus is a complicating factor. This serum includes antibodies against streptococcus hemolyticus and other strains of streptococcus.

Mulford Pneumo-Strepto-Serum

The difficulties and inconvenience of separate injections of Antipneumococcic Serum and Antistreptococcic Serum may be avoided by using Mulford Pneumo-Strepto-Serum, which contains antibodies against all the various strains of pneumococci and streptococci employed in preparing the specific serums.

An injection of 100 mils Pneumo-Strepto-Serum is equivalent to 100 mils Antipneumococcic Serum and 100 mils Antistreptococcic Serum.

All the above serums are supplied in 50-mil packages with the Mulford perfected intravenous apparatus

MULFORD
FOR THE CONSERVATION OF LIFE
LABORATORIES

40834

H. K. MULFORD COMPANY

Manufacturing and Biological Chemists

Philadelphia, U. S. A.

THE

AMERICAN JOURNAL

OF THE MEDICAL SCIENCES

OCTOBER, 1919

ORIGINAL ARTICLES

THE CARDIAC PHASE OF THE WAR NEUROSES.*

By Alfred E. Cohn, M.D.,
NEW YORK.

(From the Hospital of the Rockefeller Institute for Medical Research.)

In an inquiry into the state of our own knowledge, it is useful to institute a comparison of our thoughts with those held at a former stage of development of the same subject. It is especially gratifying to be called upon to do this in the present instance, because the first serious attention was given to this matter by Da Costa, an American, and the study was of so excellent a nature as to leave no doubt that a recognizable malady had been described.

In 1871, Da Costa[1] published the account of an affection called by him "The Irritable Heart of Soldiers," in which palpitation of the heart, cardiac pain, rapidity of the heart-rate, shortness of breath and nervous disorders, such as headache, giddiness and disturbed sleep, were the dominant complaints. Associated with these, he mentioned hyperesthesia of the skin, blueness of the lips and hands and a mottled condition of other portions of the skin. Indigestion, abdominal distention and diarrhea, itching and sweating were also noticed. In certain cases, Da Costa found that the heart was normal in size, and in them it was his opinion that the affection was functional. In others he found the organ hypertrophied. In neither group was a cardiac murmur an important

* Read in part before the Congress of American Physicians and Surgeons at Atlantic City, June 17, 1919.

[1] On Irritable Heart: A Clinical Study of a Form of Functional Cardiac Disorder and its Consequences, Am. Jour. Med. Sc., 1871, i, 52.

finding. He believed that the functional and organic affections, "apparently dissimilar states, were in reality one, or rather that one grew out of the other," and, further, that he could "demonstrate . . . the links connecting the disorders." The disorder, he thought, "either gradually subsides or it passes by degrees into cardiac enlargement." He founded the treatment on rest, and aided it by giving digitalis, atropin and aconite to relieve one or other of the symptoms, for which each remedy appeared to be especially serviceable. The soldiers, "before being sent back to their regiments, were tested by running and other exercises, with a view to seeing how the action of the heart was affected." Some he "had the opportunity of examining after they had rejoined their regiments," and of others he heard that "they were fully able to fulfil all required of them." Of especial interest is Da Costa's conception of the cause of the malady. He did not believe that he had come upon a new affection. He thought that similar complaints must have existed, and he studied, accordingly, the medical military history of other armies. He found, for instance, that "palpitation" was a cause for invaliding home to England from hospitals of the Army of the East in the Crimean War. He found mention of it also in Sir Henry Havelock's army in India. But he failed to find it mentioned in Sir John Moore's retreat, in Lord Clive's campaign in India, in Napoleon's campaign culminating in the surrender at Ulm and in his retreat from Russia. He looked for mention of it especially in these campaigns because he expected to find it in troops that had been exposed to enormous exertion, such as had been the case in these. And he was impressed with its frequency in the Northern Army in the Civil War. "Whether among the Southern Armies the same affection was common I am unable to say, though from some facts that have been mentioned to me I think it was. And it would be strange, indeed, if men of the same race, transformed into soldiers under much the same circumstances, and though operating oftener on interior lines, enduring, on the other hand, generally more privations, should have escaped. "We find," he says, "quick and long marches, heavy work, producing the affection, or even slight exertion in those whose constitution has been impaired by insufficient or indigestible food, or whose strength has suffered, or condition of the heart been disturbed by diarrhea or fever. We find it most readily developed in those previously weak and unaccustomed to fatigue or subject to rapidly quickened circulation. We find it kept up by irksome equipment and other causes, but not generated by them."

That the affection was not distinctly recognized and described earlier does not surprise Da Costa. To those who have followed the rapid additions to knowledge in the study of the behavior of the heart in the last fifteen years the observation which follows has special interest. To have recognized the affection would have been

surprising, "when," as he says, "we reflect how almost entirely the accurate knowledge of diseases of the heart is the knowledge of our time."

From Da Costa, then, we have the description of an affection so clear that there was no difficulty in identifying the cases when they appeared in the armies during this war. To his conception of the disorder, as depending upon infection and exertion and of his system of therapy, there will be occasion to return in the discussion.

Since then the affection was seen and described in India by MacLeod,[2] and by him was attributed to campaigning in the tropics, and was, in consequence, called the "Tropical Heart." Disability from unexplained cardiac causes had been so great that the British War Office at one time accepted the suggestion that the form of accoutrements might be responsible for the difficulty, and, therefore, altered the crossed straps for support of the soldier's pack.[3] A similar thought had come also to Da Costa.

Between the Civil War and the war just finishing there has been mention a number of times of similar affections. It is, I believe, correct to say, however, that it was Da Costa's opinion which exerted the greatest influence in this field.

During the present war, cases appeared in such numbers as to direct attention to them in the Allied Armies and in those of the Central Powers. Many studies have been made in Germany and Austria, in Italy, France and England, and, more recently, in our own country. I believe the number of papers so far published exceeds 250.

In England the need for directing opinion was soon felt. The Medical Research Committee, organized under the National Health Insurance, made a first report in 1915–1916 of the investigations of cardiac disorders of military importance. In England, early in 1916, the Director-General of the Army Medical Service set aside the Hampstead Military Hospital, where these so-called cases of "Irritable Heart of Soldiers" were received for study and treatment. An advisory committee, consisting of Sir Clifford Allbutt, Sir James Mackenzie and Sir William Osler, was appointed. Dr. Thomas Lewis was called to take active charge of the work. The forethought of the British authorities in providing for the study of this important affection had important results. The usefulness of their "Report upon Soldiers Returned as Cases of 'Disordered Action of the Heart' (D. A. H.) or 'Valvular Diseases of the Heart' (V. D. H.)," written by Dr. Thomas Lewis and his collaborators,[4] deserves special notice. To the same authorities

[2] Tropical Heart, Jour. Trop. Med., 1898, i, 3–4.

[3] Wilson, R. McN.: The Irritable Heart of Soldiers, British Med. Jour., 1916, i, 119–120.

[4] Disordered Action of the Heart (D. A. H.) or Valvular Diseases of the Heart (V. D. H.). Special Report Series No. 8, Medical Research Committee, National Health Insurance.

and to Dr. Lewis the U. S. Army is in debt for their interest in the training and instruction of the medical officers selected by the Surgeon-General's office for subsequent duty in the American Expeditionary Forces. Following the example set by the British, Major Janeway first and Colonel Longcope later made plans for the further pursuit of these studies in the United States. The Surgeon-General, accordingly, set aside 200 beds at U. S. General Hospital No. 9 at Lakewood, where a service was organized and work was carried on under the direction of Major Francis W. Peabody.

A catalogue of the symptoms of the disorder contained in the British and in other reports is not essentially different from that given by Da Costa.

I give now the description of a severe case—a not uncommon picture:

The patient is obviously distressed. His face bears the marks of anxiety; he is likely to be thin; his eyes are troubled; there are vertical furrows in his brow, the lines about his nose and mouth are drawn. His lips are bluish; his skin mottled; his hands often purple. He trembles and his trembling is a coarse shake. The shake involves his extremities, often only his hands, but I have seen men shake, arms and legs, and sometimes their bodies and heads as well. He presents a memorable picture.

He has reported sick for one of several reasons: because of breathlessness, on account of which he has been forced to fall out on hikes; because of pain in the chest, or sense of fatigue or of dizziness, or because of palpitation in his chest.

On examination the motions of the extremities are coarse and their extent is likely to increase when attention is directed to them. The skin is cold, the palms wet and clammy; profuse sweat pours from the axillæ, though the room is cool; there are areas of hyperesthesia of the skin, especially over the precordium, or, as Robey and Boas[5] have shown, areas of hypesthesia; the tendon reflexes are exaggerated; the mucous membrane reflexes are gone. The examination of the separate organs shows no striking abnormality. The size of the heart, as Meakins and Gunson[6] have shown, is no larger than that of normal persons, when attention is paid to body weight. There is reason to think that this need not always be true, for soldiers after campaigning may have larger hearts than persons not subject to this exertion. Karsner[7] has called attention to this fact in a study of the weight of the heart in soldiers who were in the war more than twenty-two months and who were more than twenty-seven years old. In the measurements which I made

[5] Neurocirculatory Asthenia, Jour. Am. Med. Assn., 1918, lxxi, 525–529.

[6] Orthodiagraphic Observations on the Size of the Heart in Cases of So-called "Irritable Heart," Heart, 1918, vii, 1–16.

[7] Acute Endocarditis Following War Wounds, Including Notes of Heart Weight and Arteriosclerosis in Soldiers, Arch. Int. Med., 1918, xxii, 296–311.

on 211 soldiers returned from hard service with the American Expeditionary Forces there was, however, no difference between the size of their hearts and the figures published by Dietlen.[8] There need be no murmur. But when one considers how frequently systolic murmurs have been found during the draft examinations, one expects that unimportant murmurs will be found in a number of cases. The heart-rate is elevated and lies between 90 and 130—in 75 per cent. of the cases, according to Hume;[9] the rate may reach over 150; but in about 10 per cent. the rate may be below 80. The blood-pressure as observed by Lewis, Cotton and Rapport[10] and by Sturgis[11] is usually normal. Sturgis made a careful study of this point at U. S. General Hospital No. 9 and found that with proper attention to technic the systolic and diastolic pressures were quite normal, the systolic pressure being 117 mm. and the diastolic 75 mm. No doubt if pressures are read just after men have reported for examination the pressures may be be high, sometimes 140 mm. or more. The high level then probably results from the elevation of rate, due no doubt, to excitement, though in examining recruits it was noticed that equally high pressures exist without elevation in rate. I do not discuss the mechanism of this phenomenon.

The breathing is rapid and shallow. The rate usually is 40, but rates of 80 have been described, and on rare occasions a constant rate as high as 200 has been seen.

This, then, may serve as a general description of the symptoms and signs. I have chosen to describe a severe case. After the experience at Colchester, where cases were severe rather than mild, one was not at first prepared for the mild cases which appeared in the hospitals of the American Expeditionary Forces in the spring and early summer of 1918. A single complaint of a mild order was rather the rule. Late in the summer and in the autumn the severe grades were common.

There will be no serious difference of opinion among medical officers that there are large numbers of cases of this sort. In the British Army, 421,877 men were discharged as unfit to August 31, 1918. Of these, 41,699, or about 10 per cent., were discharged on account of heart disease; most of them probably of the type called "Disordered Action of the Heart" (D. A. H.). In the United States Army there were rejected from February 18 to October 15, 1918, 467,694 men, of whom 61,142, or 13.07 per cent., were rejected for heart or bloodvessel defects. These figures probably include rejections at the draft and discharge from service for unfitness.

[8] Deutsch. Arch. f. klin. Med., 1907, lxxxviii, 55.

[9] Study of the Cardiac Disabilities of Soldiers in France, Lancet, 1918, i, 529–534.

[10] After-effect of Exercise on Pulse-rate and Systolic Blood-pressure in Cases of "Irritable Heart," Heart, 1915–17, vi, 269–298.

[11] Personal Communication. Observations to be published.

But when the nature of the symptoms is considered, together with the physical signs, all pointing clearly to derangement of the organs of circulation, opportunity is provided for divergence of interpretation of the significance of the symptoms.

I have already indicated Da Costa's belief. Sir Clifford Allbutt[12] appears to think that the researches of Lewis and Barcroft's "seem to discover a new disease, or, rather to discriminate more exactly the features and nature of a disease less clearly apprehended already by Da Costa and others as 'soldier's heart,' or by those of us who have written upon 'neurasthenia' as 'cardiac neurasthenia.'" And Sir James Mackenzie[13] comes to this opinion: "Taking into consideration all the facts, it will be found that the condition from which certain of these soldiers suffer, who are usually understood to have acquired a heart affection, is not, properly speaking, cardiac in origin, but is the outcome of an injury to other systems as well as the heart, such as the central nervous system." In describing the treatment he says: "They often feel miserable, so that there is a mental side to the case which is aggravated by the supposition that there is something amiss with the heart." His view is that the main trouble is one of exhaustion, the phenomena of exhaustion being more evident in one organ in one case and in other organs in other cases. Mackenzie considers the relation of cases of this type to infection and intoxication, but is inclined to separate them both in etiology and in treatment.

Lewis[14] has given a detailed description of his conception of the "effort syndrome." "When a healthy man takes exercise, and this exercise is sufficiently stressful or prolonged, he becomes aware at the time of the effort, or after it has ceased, of certain symptoms, and he presents certain physical signs." Lewis describes the signs and symptoms in detail and then continues as follows: "To these physiological symptoms and signs briefly described as a group. I apply the term 'physiological syndrome of effort.' The term is used as a convenient description of the chief changes, subjective and objective, which are manifested by the human body in its relation to exercises. When I use the term 'effort syndrome' I have in mind the symptoms and signs which follow exercise in health, but I believe I recognize the same or a very similar group of symptoms and signs in a large class of patients in ill health. In patients of this class if no signs of disease are anywhere discovered I say that they suffer from the 'effort syndrome.'" In discussing the relation of the "effort syndrome" to the nervous system he has this to say: "In describing these nervous manifestations I do not wish to be

[12] The Investigation of the Significance of Disorders and Diseases of the Heart in Soldiers, British Med. Jour., August, 1917, ii, 139–141.

[13] The Soldier's Heart, British Med. Jour., 1916, i, 117–119.

[14] The Soldier's Heart and the Effort Syndrome, London and New York, 1918, pp. 3 ff. and p. 49.

misread. These symptoms do not stand by themselves in our patients. I regard them as additions. Few of them are, I think, essential parts of the 'effort syndrome.' Nevertheless in many of our patients the condition of the nervous system, whether it be hereditary or acquired, is such as to exaggerate those complaints which belong properly to the 'effort syndrome.'"

The symptoms which have been described may clearly be referred to the heart and circulation. But they do not correspond specifically to any given lesion of this system. They have, in consequence, by different observers, been associated with a variety of diseases, and that one or other of these associations exists has been maintained with some heat. Obviously, such symptoms occur: (1) In chronic diseases of the heart, both of the endocardium and myocardium. (2) There can be no doubt also that they occur in relation to acute infectious diseases, in which connection they are familiar. (3) They are seen in the state of hyperthyroidism. (4) They are included in the symptoms of the neuroses in peace as well as in war.

It is necessary to discuss the arguments advanced in favor of each of these views:

1. I take those views relating the symptoms to an affection of the heart. Few physicians now believe that a valvular disease exists whenever a murmur is heard. There was always general appreciation of the fact that many individuals presented murmurs that were of no prognostic importance. But it is, no doubt, safe to say that the frequency of these in the recruits that were examined during the past two years was unexpected. In 214 soldiers who had seen hard service overseas, that I examined with care, I found murmurs in 109 instances, or 50 per cent. In 68 the murmur was heard in the recumbent posture only; in 13 in the erect posture only; in 28 it was heard in both positions. One examines the relation of the murmurs to phases of respiration more carefully than formerly and attends more than formerly to the influence of posture. Without doubt the presence of insignificant murmurs has occasioned the rejection of many men for service in the army. These murmurs are usually *smooth* and accompany or follow the first sound. But *rough* murmurs immediately preceding or forming part of the first sound have also occasioned difficulty. One is familiar with this type of roughening of the first sound when the rate is rapid, and especially when there is exaggeration of the heart's action. It is possible that this roughening has been taken as a sign of mitral stenosis, the more in that the second sound is accentuated. These signs have, I am afraid, been given too great importance, the more because their occurrence exceeded in number the incidence of mitral stenosis at autopsy, 196 in 4791, or 4 per cent. at Guy's Hospital, according to the statistics of Samways, quoted by Osler.

The size of the heart has been another misleading sign in the distinction of these cases from chronic heart disease. Wenckebach,[15] Karsner[16] and others have indicated that the hearts of soldiers are greater than those of controls. Although without systematic roentgenological confirmation, many physicians in the Expeditionary Forces formed the same opinion, but measurements which I have recently made give a different result. Since their return to America, through the courtesy of General Shanks at the port of Hoboken, I have been able to examine 211 soldiers. The average size in these corresponds closely to the figures given by Dietlen. Given, then, possibly the enlarged heart of soldiers, the insignificant murmurs and the complaints of the men which seem to point to malfunction of the heart, it would be remarkable if the suspicion had not arisen that chronic heart disease is present. It has been shown, on the other hand, by Meakins and Gunson[17] that in most of their cases of Irritable Heart the heart was actually smaller than the controls. To differentiate, involves, on occasion, making a nice distinction. But when all the factors concerned, the personal history, the circumstances of the war and an appraisal of the physical signs are taken into account there are a large number of cases in which one is satisfied that organic heart disease does not exist.

2. The relations of the symptoms of the Irritable Heart to convalescence from acute infectious disease is important, for it has been held by competent physicians that the cause of the Irritable Heart depends on this. Da Costa, for instance, believed that fevers, especially diarrheal fevers, were likely to be followed by cardiac symptoms. The experience is, I believe, general that after acute infectious diseases it is not uncommon to find that the rate of the heart remains elevated; it is frequent in acute rheumatic fever; it is true sometimes in lobar pneumonia, in tuberculosis and in typhoid fever. It is said to have been not uncommon after trench fever, and, according to Bridgman, in influenza. Tachycardia in the convalescence from these diseases is on occasion associated with pain and shortness of breath; it is almost a rule that patients are for some time after recovery from the infection unable to work as well as before. If the attempt to work is made the sense of fatigue or more uncomfortable sensations still soon terminate the effort. When the cardiac symptoms are accompanied by nervous phenomena the nervous symptoms may be regarded as being superadded to the cardiac ones and the two together taken to represent an occurrence apart from convalescence. It is doubtful whether nervous symptoms such as are seen in the Effort Syndrome, the name used to designate the Irritable Heart in the Expeditionary

[15] Ueber Herzerkrankungen bei Kriegsteilnehmern, Verhandl. d. a. Tagung. d. l. Kong. f. inn. Med. in Warschau, 1916, pp. 50–67.

[16] Loc. cit.

[17] Loc. cit.

Forces, are common under these circumstances. There should be no difficulty in recognizing this condition. It runs a more or less definite course and ends in recovery.

Convalescence from an acute infectious disease assuredly cannot be urged as the cause of irritable heart, when, as happened in so many cases, there had been no infectious disease. Nor even if there has been an infectious disease like trench fever can this be said to be the cause of the Irritable Heart when a similar convalescent state is found following other infections. The heart in convalescence after acute infectious diseases and the Irritable Heart are probably not the same thing.

3. To distinguish the Irritable Heart of soldiers from the hyperthyroid heart presents genuine difficulties, for there are similarities between the two conditions. In both the rate is rapid, the size of the heart often greater than normal, abnormal sounds dependent on the rapid rate and on overaction are likely to be present and a shake or tremor of the extremities is common. There may be diarrhea; there is exophthalmos or the semblance of it. The similarities between the two conditions must be admitted, but there are grounds for disbelieving that patients suffering from the Irritable Heart are cases of hyperthyroidism. In the first place there is no genuine exophthalmos, but the look of anxiety which often gives the appearance of prominence to the eyes. Then in many soldiers who live near the Great Lakes or in the northern tier of States a thyroid tumor has been found. It has indeed been shown by McNee and Dunn in the British Army that the thyroid gland was heavier than normal in 65 healthy men killed in action. The weight given by them is 26.7 gm. Weighing the gland, they contend, shows the presence of enlargements not indicated by physical examination. These tumors are, however, as often present, as Addis and Kerr[18] have shown, in men who have not the Irritable Heart. The tremor of Graves's disease is not found, but instead there is a coarse shake, the excursion of which increases while attention is given to it. The rate of the heart is not continuously high but falls during rest and sleep. If in Graves's disease the heart and the breathing attained rates as high as in the Irritable Heart, it is almost certain that during rest and sleep the high rates would be maintained and the breathing would be carried on with difficulty. In point of fact the situation is different in the Irritable Heart. During rest and sleep the rates of breathing and of heart-beat fall to normal. Peabody, Wearn and Tompkins[19] studied at U. S. General Hospital No. 9 the basal metabolism of 57 cases, in 24 of which the diagnosis of hyperthyroidism had been made by competent observers. In

[18] The Relative Frequency in Recruits with and without Thyroid Enlargement of Certain Signs and Symptoms Which Occur in Neurocirculatory Asthenia, Arch. Int. Med., 1919, xxiii, 316–333.

[19] The Basal Metabolism in Cases of "Irritable Heart of Soldiers," Medical Clinics of North America, 1918, ii, 507–515.

none of them was the metabolism above normal, whereas the usual high rate of 60 and 61 was found in 2 true cases of Graves's disease. The problem was studied also by Lewis and his associates, who failed to find a reason for assuming a relation between the two disorders. Although the two conditions have resemblances there is reason for doubting their identity. That malfunction of the thyroid gland may underlie the condition we call the Irritable Heart is a subject still open to investigation. It may produce these signs and symptoms by continuous or by intermittent activity in response to psychic stimuli or to stimuli arising within the body. For the present it is important to lay stress on the fact that the specific knowledge so far accumulated fails to bear out this contention.

It should now be clear that in the Irritable Heart of Soldiers symptoms and signs occur which resemble signs occurring also in convalescence from infections in chronic heart disease and in Graves's disease. But it should be understood that these signs may appear without having a relation to any of these diseases.

On account of the view in which this disorder was held before the war, especially on account of the influence Da Costa had on the subject, these cases were taken to lie in the field of cardiovascular diseases. It has therefore been my purpose to show that in the usual sense there is no abnormality of the heart, nor is the correction of the disorder amenable to methods usually employed in the treatment of heart disease. Indeed, the interest of patients so suffering may be better served at the hands of physicians trained to understand affections of this nature. The point may in fact be raised whether the improper conception has not been productive of harm in individuals who have been treated for heart affections when treatment should have been directed to a neurosis, not only the patient but also the army being sufferers by the mistake.

4. It remains, then, to show on what grounds the view is founded that this symptom complex is neurotic. There are, it is agreed, cases in large number presenting cardiovascular signs and symptoms which it is desirable not to group with those well-defined diseases that have just been discussed. Besides the cardiovascular symptoms of which they complain, it is generally admitted that the patients make that impression of nervousness to which former observers have given attention, even though emphasis has not been laid on this phase of this malady. The nervousness is of the variety already familiarly classed in states of anticipation and anxiety neuroses. The facies is significant of this state; the brow is furrowed; the eyes are troubled; the mouth is drawn. The reaction to unexpected noises is prompt and exaggerated. There is marked shakiness of the hands, limbs, body and head. There is absence of mucous membrane reflexes and exaggeration of the tendon reflexes. There is a tendency to insomnia and to disturbing dreams.

Neurologists and neuropsychiatrists have, during the war period, had plentiful opportunity of studying such cases. Mott[20] called them examples of neurasthenia. He says the men "complain of the usual symptoms of neurasthenia—viz., tremors, fatigability by mental and bodily effort; loss of consciousness and irresolution; hyperesthesia, paresthesia and pains which they consider to be rheumatic; fainting attacks; precordial pain and palpitation; feeling of dizziness; insomnia and dreams; loss of appetite; headache and gastric troubles." Salmon,[21] McCurdy,[22] Schwab[23] and others have uniformly interpreted them as cardiac manifestations of the neuroses.

But it is not only the cardiovascular symptoms which have caused difficulty in classification. Gastro-intestinal complaints depending on similar associations have, without doubt, been attributed in the army, as they have been sometimes in civil life, to incorrect causes. Musser,[24] for instance, has shown that in the examination of the gastric contents of frank Effort Syndrome cases after the ingestion of a test-meal the acidity continues to rise long after it has returned to normal in control cases. But of great interest are the respiratory complaints which have appeared especially after exposure to deleterious gases. Respiratory distress when associated with the symptoms of Disordered Action of the Heart has been studied especially by Barcroft, Hunt and Dufton[25] and by Haldane, Meakins and Priestley,[26] and a specific pathology underlying these symptoms has been suggested by them. In their conception the late stages of gas-poisoning present a chain of symptoms comparable to those arising from oxygen want in mountain sickness. Strauss[27] saw at Mesves many gassed soldiers who suffered from nocturnal asthma, and he supposed that an abnormality existed over and above a nervous state. There is rapid and shallow breathing, due, according to Haldane, Meakins and Priestley, to exaggeration of the Hering-Breuer reflex. The exaggeration is said to originate in the irritation of the lung tissue after injury inflicted by gassing, "or else by causes acting more generally on the nervous system." Anoxemia follows on this disturbed mechanism and is accompanied by the symptoms of oxygen lack. Polycythemia, first described

[20] War Psychoneurosis, Lancet, 1918, i, 127–129.

[21] War Neurosis, National Committee for Mental Hygiene.

[22] War Neurosis, Psychiatric Bull., July, 1917.

[23] The War Neuroses as Physiologic Conservations, Arch. Neurol. and Psychiat., 1919, i, 579–635.

[24] Personal Report to the Senior Consultant in Cardiovascular Diseases.

[25] The Treatment of Chronic Cases of Gas-poisoning by Continuous Oxygen Administration in Chambers, Reports of the Chemical Warfare Medical Committee No. 4.

[26] Investigations of Chronic Cases of Gas-poisoning, Reports of the Chemical Warfare Medical Committee No. 11.

[27] Personal Report to the Senior Consultant in Cardiovascular Diseases.

by Hunt and Price Jones,[28] is also present. Barcroft, Hunt and Dufton have shown that treatment of their thirteen patients in a chamber supplied with 40 per cent. of oxygen is followed by relief of the respiratory symptoms and a reduction of polycythemia, temporarily, at least, takes place. This is apparently not true of effort syndrome patients who have not been gassed.[29] Unfortunately the late histories of these patients are not available. Unfortunately, also, it has been impossible to study similar cases in the American Army. Medical officers not only in the Expeditionary Forces but also in this country, through the Surgeon-General's Office, were requested to report them on their own account, and because it was supposed they might become important from the viewpoint of war-risk insurance. Cases of cyanosis, bronchitis and asthma have been seen, but their identity with the British cases has not been established. In any case their number is small, but proper leisure and proper facilities for detecting and studying them have not been available.

There is this further group of cases: Many men who were gassed have been examined since the end of the war, and although they no longer complain of respiratory symptoms, and although physical examination and examination by roentgen rays fail to show that a pulmonary abnormality exists, and although their hearts appear to be sound, they complain still of pain in the chest, variously distributed, arising especially on exertion. They complain, moreover, of shortness of breath on exertion, the nature of which, on such careful examination and testing of functional ability as I have been able to make, is quite unclear.

With these facts in view it is striking that in reports by Strauss,[30] Lævine[31] and White[32] and others the greatest number of cases of the Effort Syndrome occurred among men who were gassed. Strauss especially reported a large number of cases suffering from respiratory symptoms. St. Lawrence[33] studied the effort syndrome cases at the special training battalion, maintained for orthopedic cases at St. Aignan. He found that 9 of 17 cases reporting sick on account of these symptoms were gassed. Of 1500 other cases at the camp, 65 gave a history of gassing, and most of them gave some evidence of the Effort Syndrome of a mild type. The striking thing is that no cases other than those of gas origin showed symptoms sufficient to require report at sick call. "It was interesting to find," says St. Lawrence, "that a neurologist working beside, but independently

[28] A Note on the Later Effects of Poisoning by Asphyxiating Gas, Reports of the Chemical Warfare Medical Committee No. 15.

[29] Barcroft, J., Hunt, G. H., Dufton, D.: Treatment of Patients Suffering from "Effort Syndrome" by Continuous Inhalation of Oxygen, Reports of the Chemical Warfare Medical Committee No. 12.

[30] Loc. cit.

[31] Personal Report to the Senior Consultant in Cardiovascular Diseases.

[32] Ibid.

[33] Ibid.

of me, classified practically the same men as war neuroses." These officers assumed no special pathology for these cases. A reason for the occurrence of the Effort Syndrome symptoms in the gassed is in fact difficult to assign. It has occurred to me that an explanation may be supplied in this fashion. It is known that in the early part of the summer of 1918 gas discipline was not exemplary. Later, for that reason, the immediate and subsequent dangers from gas poisoning were emphasized to such an extent that it is not unfair to say a gas-phobia was developed. Possibly the unequal effect of gas on different individuals added to this attitude toward it. Men, for instance, who were apparently similarly exposed suffered in very unequal degrees. The recollection of these facts during hospitalization may have had an important bearing on the development not only of cardiac but also of respiratory symptoms. The respiratory cases are said to be due to exaggeration of the Hering-Breuer reflex occasioned by an irritative lesion of the lungs, but it is also said that "causes acting more generally on the nervous system" may be at fault. This suggestion, made by Haldane, Meakins and Priestley, is of special interest, for it may be that in their cases the derangement of the Hering-Breuer reflex brings about a disorder of respiration in the same sense that derangement of the vasomotor and cardio-inhibitory centers brings about Irritable Heart of Soldiers, both conditions being expressions of a neurosis. The number of men affected in this manner must in any event be few; 90 per cent. of all the gassed probably return promptly to duty. This was true in the British Army for the Boulogne district.[34] And of the remainder these considerations apply to a small number only. It is to be hoped that further light on this subject may be shed by studies pursued by the method of exact investigation.

That there are still other ways in which men suffer, aside from symptoms referable to the cardiovascular, gastro-intestinal and respiratory systems, is well known. The musculoskeletal system was frequently the method of expression of the neurotic state. This form is familiar in aphonia and in contractures and has been abundantly described in the neurological literature. I desire merely to point out that these are probably other manifestations—other expressions of a similar psychic mechanism.

It seems scarcely necessary to dwell on the reasons for the occurrence of anxiety states in the war. Descriptions of its terror were sufficiently familiar, so that an anticipation of what he might experience was lively in the mind of the least instructed recruit. This anticipation was operative in British recruits in England, we are told, as well as in the United States. It is, of course, clear that men vary in their behavior in the anticipation of such expe-

[34] Elliott quoted by Meakins, J. C., and Priestley, J. G.: Reports of the Chemical Warfare Medical Committee No. 16.

riences. We recognize the timorous and the hardy. That the timorous had a lively antagonism to leaving the United States on such an expedition need surprise no one. Such men were plentifully seen. Whether their dislike for adventure of this kind be attributable to constitutional inferiority, to race or to other causes is a matter of interest. It has been shown by Wolfsohn[35] and by Oppenheimer and Rothschild[36] and by Campbell[37] that heredity and previous personal history are significant factors in those men who are the first to fall out showing the symptoms of the Effort Syndrome. The mechanism of inferiority of this type is an important study. A difficulty with all these investigations is that they fail to consider the behavior of those men of similar family and personal history who managed to endure successfully the hardship and anxiety of war. Nor does it suffice in a study of this nature to assign a reason for failure in the case of the men who failed first and to dismiss the subject with the discovery of these so-called inferiors. The literature of the neuropsychiatrists contains the histories of many men who entered the war in the class of the hardy, and who, in the end, failed as the timorous failed in the beginning. It requires little imagination to understand the influence the sights and sounds and the experiences of actual warfare must have had gradually to wear down the endurance of the most resistant; for this reason many of the hardy failed. No doubt many men passed through the war psychically untroubled. But no doubt, also, it would have been difficult at the beginning to predict which men were likely to endure. Men the least likely may have succeeded; men the most likely may have failed. Men may indeed all be regarded as being vulnerable in this regard. The timorous naturally succumb first. They are often those who had already suffered from the wear and tear of life when the war began. The war itself supplied wear and tear, and as the hardier suffered, they, too, were worn down; they too, succumbed. There is involved, then, from this point of view not one factor, native predisposition, but two, native predisposition and time. That after four years of war, men as unlikely for service as any that were seen in our cantonments were numerous in the British Army, anyone who saw the cases at Colchester can testify. It may be said that the time factor applies only to the hardy, and this may be true. But no report has taken into account the successes of the less hardy and of the timorous—and, unquestionably, there have been many such. Taking constitutional predisposition into account is essential, but as a complete account of failure it appears to be inadequate.

[35] The Predisposing Factors of War Psychoneuroses, Lancet, 1918, i, 177–180.

[36] The Psychoneurotic Factor in Irritable Heart of Soldiers, Jour. Am. Med. Assn., 1918, lxx, 1919–1922.

[37] The Role of Instinct, Emotion and Personality in Disorders of the Heart, Jour. Am. Med. Assn., 1918, lxxi, 1621–1626.

This view suggests the reason for a difference in the nature of the cases seen here and seen in France. The difference was apparent to numerous observers. Here the undoubtedly timorous floated to the surface directly, were recognized immediately and were eliminated. This type became well defined. They were the constitutionally predisposed, the timorous. There reached France those of this group with more of reserve and these no doubt fell first there. But, on the whole, the bearing of those who came to France was better and the general impression they made superior. This difference accounts for the distinction that has been made between the classes seen in the two places.

Other facts bear on the probability that the symptoms of Irritable Heart depend on a neurosis. The symptoms were all but unknown in the severely wounded. The faces of these men were turned definitely away from the front. The same may be said of the severely gassed. And it is commonly admitted that prisoners of war were quite free from such ailments. All these men were finished with the war. It was most striking that in the week following November 11, 1918, the day of the signing of the Armistice, it became difficult, while travelling, as I undertook to do, among the Base Hospitals, to find the cases which had been so frequent. Their number diminished, practically disappeared, except for the more severe types. The same observation was made in respect to the musculoskeletal cases, the so-called functional joint cases. At Base 117, the neuropsychiatric hospital, special precautions were taken lest the disappearance of symptoms receive tactless comment, with subsequent injury to the patients. It is not the intention, however, to contend that no cases were seen after this time. Reasons for the presence of Irritable Heart cases, perhaps as numerous as in civil life, remained, and there were added other reasons for their occurrence as well. A similar situation prevailed among the neuropsychiatric cases.

The outlook for the cases of Irritable Heart depends on the conception one has of their nature. If, in essence, they depend on malfunction of the thyroid gland or on malfunction or hypertrophy of the heart in Da Costa's sense, their future will be foretold as that of these conditions. But if the symptom complex is regarded as a neurosis, there is, with suitable treatment, reason to think that recovery will take place in all but the severe cases. Hume,[38] for instance, returned the cases after four weeks. In an army it is, however, not enough to return men to the front; unless they are genuinely fit for duty, they retard rather than help the work of their organizations. There are available statistics such as Lewis's and Bridgman's to show what the result of treatment has been. It is, however, important to have records on a greater scale.

[38] Loc. cit.

Viewed as a neurosis, then, the outlook for a rapid recovery is favorable. But if the view of Da Costa is taken, of the possibility of a functional derangement of the heart passing into an organic, a hypertrophic one, the difficulty of prognosis is greater. For here, so far as service is concerned, the soldier ought probably to be discharged and his future viewed with uncertainty. Herein is involved the question of the size of the soldiers' hearts, of which mention has already been made.

Treatment similarly awaits a decision on the nature of the disorder. Here, too, Da Costa had definite views. He put patients to bed to rest and he gave them drugs—digitalis, aconite, atropin—which he believed did good, each for a different phase of the malfunction of the heart. The effect of a number of drugs has been tried by Parkinson[39] and others during this war at Colchester. It may be said, in brief, that these were without benefit. Graduated exercises were introduced by Lewis, both to sort men with a view to determining their class of service and also to ameliorating their symptoms. There can be no doubt that, so far as classifying is concerned, the introduction of the graduated exercises was a work of signal usefulness, and giving them prominence had important results. It would, however, be ungracious to fail to recall that Da Costa made use of a similar method. It is another matter, however, whether the exercises are of benefit at the root of the malady. If Irritable Heart is a neurosis based on anxiety it is clear that exercises conducted by a drill sergeant do not meet the therapeutic indication. It is doubtful whether strength can be supplied in this manner, especially when one considers that in anxiety and fear strength ebbs—strength being then a neurological not a muscular function. It may be that the James-Lange law is applicable in this connection—that one is anxious because one's strength has fled. Into this discussion we cannot enter. But so much it has been necessary to mention to indicate the inadequacy of graded exercises as a therapeutic measure.

In the Expeditionary Forces we were led, after reflection, to adopt the view that the Irritable Heart of Soldiers was the expression of a neurosis. It was for that reason that the chief surgeon was prevailed upon to abandon the designation "Disordered Action of the Heart" (D. A. H.), borrowed from the British. For that reason, also, no term was recommended in substitute in which any organ or system of organs in the body was mentioned. It was thought a term so constructed would have unfortunate consequences, both for the individual and for the army. The term Effort Syndrome was borrowed from Lewis for several reasons: We could devise no better one; it avoided the difficulty of others already or formerly

[39] Parkinson, J.: Digitalis in Soldiers with Cardiac Symptoms and a Frequent Pulse, Heart, 1915–17, vi, 321–336.

in use; its choice was a recognition of the great service Lewis had done in bringing prominence to the subject. That we came in the end to ascribe to the term a different meaning from the one he gave to it was of small consequence; for while he thought of the affection as a syndrome resulting from effort—from any effort, in fact—we thought of it as one developing, under special circumstances, from a peculiar effort, the unusual effort demanded by the war and the unfamiliar stimuli associated with it.

The disorder having been studied and the name of the disorder having been selected, we addressed ourselves to making recommendations for the care of the patients. In this we availed ourselves of the experience of the British, who, in many respects, had attained, it seemed to us, conspicuous success. The most important advice the British gave us related to the location of convalescent camps for their reception. The British thought, and experience showed, that the camps should be built as far as possible away from the hospitals—five, ten or fifteen miles. Our convalescent camps, however, formed an integral part of the great hospital centers. The immediate effect of this was to impair the morale of the convalescent camp and to prevent the introduction of suitable therapeutic measures, because on account of the necessarily rapid rate of growth, convalescent soldiers were utilized as labor and construction troops. It is possible and even probable that the men did not suffer under this system, but it prevented an attempt at systematic therapeutic supervision by medical officers. And it was not only impossible for medical officers properly to fulfil their functions, but being untaught in work of this nature it prevented their acquiring necessary experience.

The location and adminstration of the camps were then, during the war period, unsatisfactory. Whether time, had the war gone on, would have improved this situation it is impossible to say. It is a pleasure to record, however, that those of our medical officers who were especially trained by Lewis and others for this work were unusually faithful, remained cheerful under strikingly trying circumstances and could not have failed in the end to accomplish noteworthy results.

For the soldiers the camp, as the British designed it, had a specific work to do. It was to give him back his morale, his cheerfulness and his courage. He should emerge from the camp ready to undertake his share of the burden willingly. It cannot be said that we made any important contributions to the technic of managing the soldiers. We were learning when the war ended and were meanwhile availing curselves of the experience of the British. They taught us first that there was necessary in the camp an attractive atmosphere. The barracks or huts must be well arranged and laid in grounds well cared for and landscaped. Surprising results in gardening are possible in France in a year. The soldiers,

divided in companies and battalions, were kept on a modified but strict discipline. They were instructed and amused, or, preferably, they were taught to amuse themselves. There were setting-up exercises, marches with the band; there were round games and tennis, golf and cricket; athletic competitions, lectures and picture shows. Auxiliary agencies were welcomed; the Red Cross, the Y. M. C. A. and as many more as had entertainment to offer. There were theatricals, often arranged by the men themselves; these last longer and stimulate more interest than those supplied to them. And there was plenty of music; in one British camp there were two brass bands, an orchestra, a mandolin and a banjo club. And there are many other ways of keeping the men entertained and of resupplying enthusiasm for an experience undertaken none too eagerly. Presiding over the whole were the medical officers, especially selected for this difficult and important salvage work, under whose immediate direction the work went on, the detailing for exercises and games, the graduation for fitness from class to class. With this system results were obtained. Many a soldier returned to his work uplifted in mind and in spirit, cheerfully willing to make his sacrifice afresh. It is a mistake, however, to suppose that the British acquired their camps full-blown; one commanding officer told me that the acquisition of every single piece of wood in the place represented an argument. But it was to a system like theirs to which we looked forward, and which, no doubt, we should have approached this summer had not the war fortunately cut short our career.

For civil practice this experience has a lesson. There are many unfortunates who fall into this group of patients. It will not be seriously contended that the practice of medicine has adequately studied or solved the problems connected with this phase of disease. There are problems in pathogenesis, problems in the mechanism of the disorder, problems in therapeutic organization awaiting solution.

In this paper it has been the special purpose to point out milestones in the history of this subject. Da Costa first defined it; on the basis of his work the study continued in this war. In his view the disorder arose most often as the result of infectious diseases, was most likely a functional disorder, going on to organic change in the heart, and was certainly affected beneficially by drugs. The symptoms which he described, and which we recognize. are alike. We differ from him in that we think that no matter what the predisposing cause, whether it be infectious disease, malfunctioning glands of internal secretion or gas-poisoning, the disorder is essentially a neurosis, depending on anxiety and fear; that it is removed by the disappearance of the exciting cause and that it is cured by measures designed to influence the neurotic state.

A LONG DURATION OF REMISSION IN PERNICIOUS ANEMIA.[1]

By Charles G. Stockton, M.D.,
BUFFALO, N. Y.

In his article on "Pernicious Anemia," in Osler's *Modern Medicine*, Richard C. Cabot recounts 2 cases having a remission lasting four years and a doubtful instance of six years. This author also has records of 37 long cases, that is, continuing more than four years; 3 of these lived fourteen years. This list includes 6 cases, which Cabot considers as definitely recovered.

I have to report a case first seen in 1899. It was in all respects a typical case, as the accompanying report of the blood count indicates:

October 11, 1900.

Number of red corpuscles per centimeter	1,021,300
Number of white corpuscles per centimeter	3,250
Percentage of hemoglobin (Dare)	26.0
Color index	1.3

Red cells.	White cells.	
Normoblasts, none	Polynuclears	60 per cent.
Intermediates, none	Small lymphocytes	34 "
Megaloblasts, two	Large lymphocytes	4 "
Microblasts, none	Transitional	0 "
Poikilocytes, large number	Eosinophiles	1 "
Microcytes, large number	Basophiles	0 "
Macrocytes, none	Myelocytes	1 "
Stippling, none	Eosinophilic myelocytes	0 "

There was an irregular improvement for six years, at which time, although there was a moderate anemia, the blood lost all characteristics of the pernicious type. To convey some idea of the course of the case during the earlier years the counts of the erythrocytes are given in order. The other characteristics of the blood kept in close ratio with the red count.

	Erythrocytes.	Hemoglobin.
December, 1899	2,444,000	60 per cent.
April, 1900	3,240,000	80 "
October, 1900	1,021,300	26 "
March, 1901	3,280,000	75 "
July, 1901	4,624,000	83 "
October, 1901	4,208,000	89 "
July, 1902	3,354,600	75 "
October, 1902	3,960,000	89 "
December, 1902	3,906,400	89 "
March, 1903	4,176,000	92 "
October, 1903	3,716,000	80 "
May, 1904	3,920,000	85 "
January, 1904	4,000,000	89 "
January, 1905	4,208,000	92 "
July, 1906	3,900,000	88 "
November, 1906	4,100,000	81 "
January, 1907	4,856,000	80 "

[1] Read before the Association of American Physicians, June 17, 1919.

In 1907 there were no abnormal cells found. The blood was in every way satisfactory.

As the patient was now discharged, and, although seen occasionally, was never examined as to her blood, it is impossible to state the precise condition during the intervening years. However, from 1907 until the beginning of 1918 the patient was considered to be well.

Then there was a sharp recurrence which soon became threatening. The case failed to respond to the action of atoxyl and sodium cacodylate, which drugs formerly had appeared to be of benefit. In February, 1918, the blood count was as follows:

Number of red corpuscles per centimeter	1,656,000
Number of white corpuscles per centimeter	2,700
Percentage of hemoglobin (Dare)	28 per cent.
Color index	.8 "

Red cells.	White cells.	
Normoblasts, 6 in 200 cells	Polynuclears	36.5 per cent.
Intermediates, 1 in 200 cells	Small lymphocytes	58.5 "
Megaloblasts, none found	Large lymphocytes	0.5 "
Microblasts, none found	Transitional	0.0 "
Poikilocytes, many	Eosinophiles	4.5 "
Microcytes, many	Basophiles	0.0 "
Macrocytes, great many	Myelocytes	0.0 "
Stippling, present	Eosinophilic myelocytes	0.0 "
Polychromatophilia, present		

Notes, four days before transfusion.

A transfusion of 900 c.c. from the vein of her daughter led to temporary improvement, the count rising to: erythrocytes, 3,408,000, leukocytes, 3000. The gain was transient. A fortnight later the family physician, Dr. Hall, of Bradford, Pa., reported the blood count practically where it was before transfusion. A week thereafter the patient developed lobar pneumonia and died three days later, nearly twenty years from the recognition of her first attack of pernicious anemia.

This seems to show that although a patient may escape all signs of the disease (save one) for a period of ten to twelve years, yet the disease may recur.

I emphasize that there was the disappearance of all evidence of the disease save one. That one was the continuance of achylia gastrica. In a long series of cases, private and hospital, studied during thirty years, I have not found an exception to the rule of the presence, sooner or later, of achylia gastrica. In this series of cases there have been several long remissions, but never has the gastric function been restored.

This persistence of achylia gastrica may have more significance than has been accorded it in late years. If we grant that pernicious anemia is the expression of an infection, it is not improbable that gastric infection is in some way a link in the chain.

The belief prevails that an exceptional case of pernicious anemia goes on to recovery. Has anyone ever reported the restoration of normal gastric secretion? In view of the fact that in this case, so far as I know, the most promising on record, the disease recurred twenty years after its inception, and after having a remission in which there was to all appearances good health for a period of twelve years, I feel that it may be concluded that a patient probably never entirely recovers from pernicious anemia.

The persistence of the gastric lesion points to a close pathological relation between the stomach and the anemia. In this connection attention is called to the observations of Seyderhelm,[2] of Strassburg, working with larvæ of the fly Estrus equi, occurring in the gastric mucosa of horses suffering from a severe anemia, in its characteristics said to be suggestive of pernicious anemia in man. The bibliography of this work, copied from the *Journal of the American Medical Association*, vol. lxxii, No. 9, is hereto attached.

MENINGOCOCCUS ARTHRITIS.

By W. W. Herrick, M.D.,

ASSISTANT PROFESSOR OF MEDICINE, COLLEGE OF PHYSICIANS AND SURGEONS, COLUMBIA UNIVERSITY, NEW YORK CITY,

AND

G. M. Parkhurst, M.D.,

NEW YORK CITY.

History and Literature. Osler,[1] in a clinical lecture on the arthritis of cerebrospinal fever makes mention of a treatise on "The Malignant Epidemic Commonly Called Spotted Fever," published by North,[2] of New York, in 1811, in which the author gives account of "swelling like rheumatism of the joints." This is apparently the earliest account of meningococcus arthritis. Osler also mentions a report to the Massachusetts Medical Society, dated 1810, by Thomas Welch, James Jackson and John C. Warren,[3] in which it is stated that "in some cases (of spotted fever)

[2] Seyderhelm, K. R., and Seyderhelm, R.: Die Ursache der perniziösen Anämie der Pferde, Arch. f. exper. Pathol. u. Pharmakol., lxxvi, 149. Wesen: Ursache und Therapie der perniziösen Anämie der Pferde, Arch. f. wissensch. u. prakt. Tierheilkunde, 1914, 41; Experimentelle Untersuchungen über die Ursache der perniziösen Anämie der Pferde, Berl. tierärztl. Wchnschr., 1914, No. 34. Seyderhelm, R.: XVII Tagung der Deutsch. path. Gesellsch., 1914. Seyderhelm, R.: Ueber die Eigenschaften und Wirkung des Oestrius und seine Beziehung zur perniziösen Anämie der Pferde, Arch. f. exper. Path. u. Pharmakol., 1918, lxxxii, 253.

[1] The Arthritis of Cerebrospinal Fever, Collected Reprints, 4th series, 1897–1902.

[2] Treatise on a Malignant Epidemic Commonly Called "Spotted Fever," New York, 1811, p. 15.

[3] Medical Communications, Dissertations of the Massachusetts Medical Society, 1813, ii, 135.

swellings have occurred in the joints and limbs. These have been very sore to the touch, and their appearance has been compared to that of gout. The parts feel as if they had been bruised. These swellings are in the smaller as well as in the larger joints and are often of a purple color. Those of the small joints especially soon disappear as the disease approaches its crisis."

In 1899, Gwyn[4] reported a case of meningococcemia, with meningitis as well as polyarthritis, in which for the first time the meningococcus was recovered from the blood, cerebrospinal fluid and joint exudate of the same patient.

Cecil and Soper,[5] in 1911, gave an account of meningococcus sepsis, with early arthritis without meningitis. More recently many French observers, among them Roger,[6] Netter and Durand,[7] Sainton and Bosquet,[8] and Faroy and May[9] have studied this complication of meningococcus infections.

Of the English writers, Osler[10] Rolleston[11] and Still[12] have given attention to this condition.

FREQUENCY. Among 902 cases collected from various sources 6.5 per cent. had arthritis, and of 502 recent cases in the British naval forces the percentage of arthritis was 4.8 (Rolleston).[13] Sophian remarks that this complication occurs in 10 to 15 per cent. of cases of meningococcus meningitis; Roger's figures are 5 to 20 per cent.; Osler[14] found it in 2 of 21 cases, Councilman, Mallory and Wright,[15] in 6 of 111 cases.

Accounts of postmortem study of the joints of meningococcus arthritis are meager. Still[16] found the joint lesions complicating the posterior basic meningitis of infants exclusively peri-articular. Osler considers the inflammation peri-articular as a rule and has described a case of mixed infection with the staphylococcus. The majority of students have found the rather viscid, often somewhat gelatinous exudate at times with blood and with a

[4] A Case of General Infection by the Diplococcus Intracellularis of Weichselbaum, Bull. Johns Hopkins Hosp., 1899, x, 112.

[5] Arch. Int. Med., 1911, viii, 3.

[6] Pyarthrose ankylosante du jenou et de la hauche au cours d'une méningite cérébrospinale, Marseille méd., 1918, L. V. 505–516.

[7] Les arthrites suppurées à meningococciques, Bull. de l'Acad. de méd., Paris, April 13, 1915, lviii, 441.

[8] Arthrite méningococcique de l'épaule à forme plastique ankylosante. Manifestations pulmonaires et méningite consécutives. Arthrite du Genou Post-Meningitique, Soc. méd. des hôp. de Paris, March 17, 1916, 3d series, p. 344.

[9] Bull. et mém. d. l'hôp. de Paris, 1919, No. 3, 3d series, liii, 44.

[10] The Etiology and Diagnosis of Cerebrospinal Fever, British Med. Jour., 1899, i, 1521.

[11] Lumleian Lectures on Cerebrospinal Fever, Lancet, April 19, 1919, No. 4990, Lecture III, excvi, 645.

[12] Simple Posterior Basic Meningitis in Infants, Jour. Path. and Bacteriol., London, 1898, v, 147. See also Longo, A.: Pediatria, 1917, xxv, 321; abstracted in Jour. Am. Med. Assn., 1917, lxix, 322.

[13] Loc. cit.

[14] Loc. cit.

[15] Report of Massachusetts State Board of Health, Boston, 1898.

[16] Loc. cit.

variable number of polymorphonuclears, in rare cases sufficient to form a thick greenish pus. Meningococci are not found as a rule. Most writers believe they disappear early. Experience has been almost universal that the joint exudate is completely absorbed and that no sequelæ persist. Sainton and Bosquet[17] and Roger,[18] however, have cited cases in which ankylosis of the knee, hip or shoulder has followed meningococcus arthritis. In one case the radiograph showed "rarefaction of the bone adjacent to the epiphysis." We have observed one case of necrosis of the head of the radius following meningococcus arthritis of the wrist. The meningococcus was not isolated from this lesion at operation.

In a study of an epidemic of 321 cases of meningococcus infection at Camp Jackson, N. C., from November, 1917, to April, 1919, we have been impressed with the frequency of arthritis, with the variety of its manifestations and with the clinical profit of a separation of these arthritides into different forms or types. The result of our studies has been the classification of these varieties of arthritis met with in meningococcus infections, which we here present.

Arthritis in meningococcus infection may appear in three forms or types, each having peculiar significance in diagnosis, prognosis and treatment. For convenience we shall speak of these as "Type A," "Type B" and "Type C."

As "Type A" we designate an acute polyarthritis that is frequently the initial symptom, more often one of a number of symptoms of onset, and that does not, except in rare cases, appear later than the first, second or third day of the disease. This type is a feature of many of the cases with severe infections and is usually a harbinger of a stormy course. Almost all these cases have profuse hemorrhagic rashes coincident with the polyarthritis. In many but not in all instances the arthritis is as transitory as the rash. It would seem that these early joint symptoms are due to hemorrhage into the articular and periarticular structures, especially the synovia and are identical with the hemorrhagic lesions of the skin and serous membranes.

The clinical picture is not unlike that of acute rheumatic polyarthritis. Symmetrical joints are usually involved—the wrists, knees, ankles and elbows; less often the hips, shoulders and small joints of the hands. Pain on motion is great, as is tenderness. Effusion is slight, more often absent; in no case has it been enough to aspirate. Other complications of meningococcus sepsis, such as panophthalmitis, epididymitis and pericarditis, are very frequent. Meningitis is not always present. The usual duration of this type of meningococcus arthritis is from one to six days, excep-

[17] Loc. cit. [18] Loc. cit.

tionally longer, even six weeks. Some of these prolonged cases may merge with the second form, "Type B," to be described.

Statistical Summary of Cases of Meningococcus Arthritis, "Type A." In an epidemic of 321 cases there were 12 examples of this early acute polyarthritis which we designate "Type A." Of these 8 lived and 4 died, the mortality being 33.3 per cent. Arthritis was the initial symptom in 3 cases; the symptom of the first day of the disease in 3 cases; a symptom of the second day in 1 case and of the third day in 1 case. The wrists were involved in 8 cases, the knees in 7; the elbows in 3 and the ankles in 3; the shoulders in 1 and the hips in 1; the small joints of the hand in 1; "all joints" or "many joints" in 3. There is note of rash in 10 of the 12 cases. Of these 10 cases 9 had the petechial or punctate hemorrhagic rash, 1 had the maculopapular type, while 2 had purpura combined with petechiæ. Positive blood culture was noted in 3 cases.

Of these 12 cases 5 had panophthalmitis, with destruction of the globe, 2 hydrocephalus; 2 epididymitis and 1 gangrene of the skin. Two of the 12 cases did not develop meningitis. Of the recovered cases 5 had the combined intraspinal and intravenous serum treatment, 2 had intraspinal and 1 intravenous treatment only. Of the 4 fatal cases, 2 had only intraspinal serum treatment, 1 had combined intraspinal and intravenous and 1 intravenous treatment alone. Cases receiving only intravenous treatment were those in which meningitis was absent.

Arthritis "Type B." The second type of arthritis which we designate "Type B" is differentiated from the preceding type quite sharply. Its onset is late, usually about the fifth day. With few exceptions only one joint is affected, generally the knee, occasionally the ankle, hip, shoulder, wrist or elbow. In contrast to "Type A," effusion is a prominent feature, so that aspiration of the synovial capsule is suggested in many cases. Swelling is great, but redness, pain, tenderness and limitation of motion are suprisingly slight. Often a tensely swollen knee-joint can be manipulated freely, with only moderate discomfort. In no other acute arthritis is there this striking disproportion between the swelling and the other inflammatory signs. The exudate is usually viscid, mucinous, semi-purulent, not infrequently hemorrhagic, containing pus cells numbering from 1000 per cm. to uncountable numbers. Rarely there is thick greenish pus. Meningococci are found in at least one-third of the cases. The organisms are quite as often extra- as intracellular. Systemic disturbance in the form of moderate fever is generally present. The duration of the process is usually from one to four weeks, recovery being gradual, but complete. Rarely stiffness and slight pain or muscular spasm remain for a long time.

The prognosis of the late monarthritic form is good. In our experience only 12.5 per cent. of these cases died. This is in contrast with the 33.3 per cent. mortality of "Type A" cases. It

may be that the focus of the infection in a single large joint acts as a fixation abscess and as such elaborates antibodies which play a part in establishing immunity.

The cases which we designate "Type B" numbered 16. Of these 14 recovered and 2 died. The mortality, therefore, was 12.5 per cent. The right knee was involved 7 times, the left 7; both hips, both ankles and both wrists, once each and the right shoulder once. Of the 3 cases having more than one joint involved, 2 had both knees and 1 the left ankle and right wrist.

The onset of arthritis in 1 case was on the second day, in 3 cases on the third day, in 3 on the fifth, in 2 on the sixth, while the remaining 6 cases showed arthritis on the ninth, eleventh, thirteenth, seventeenth, eighteenth or twenty-second. In 8 of these 16 cases a joint was aspirated. Of the joint exudates 4, or 50 per cent., showed meningococci. There is record of positive blood culture in only 1 case, but unfortunately the records on this point are incomplete.

The arthritis lasted two days in 1 case, one hundred and three days in another, the average duration of joint symptoms being about fifteen days. Recovery was complete in all cases but one. In this instance there was persistent muscular spasm with fixation of a knee-joint in semiflexion, requiring orthopedic treatment.

Among these 16 cases other complications were relatively rare. Panophthalmitis occurred once, epididymitis 3 times, hydrocephalus twice, pneumonia and pericarditis once and gangrene once. Of the recovered cases 2 were treated by the intraspinal method, 8 were treated by the combined intraspinal and intravenous methods and 1 was treated by the intravenous method alone. The 2 fatal cases were treated by the combined method.

Arthritis "Type C." The third type of arthritis, "Type C," which may be met in meningococcus infection, is the well-known serum arthritis. This does not differ from the serum arthritis seen after serotherapy in pneumonia or other acute disease. No description is called for here. It is of interest that this sequel of serum administration appears to be quite as common after intraspinal serum treatment as after combined intraspinal and intravenous methods. In our series of 321 cases there were 12 examples of serum arthritis, of which 6 were treated by each method.

The characteristics of the three types of arthritis are set forth in tabular form in Table I.

"Purpura Rheumatica" and Meningococcus Sepsis. During a consultation visit to another base hospital one of us (W. W. H.) had opportunity to observe the following case:

A soldier was admitted to the hospital, March 6, 1918, giving history of an attack of tonsillitis a few weeks before, since which he had not been well. Malaise and lack of strength and energy were constant. On admission there was great soreness of the muscles and joints, a hemorrhagic eruption and a temperature of

101°. A diagnosis of purpura rheumatica was made. During the next ten days several internists, a neurologist and a dermatologist concurred in the diagnosis. Moderate polyarthritis with purpuric spots, more numerous about the joints, continued without meningeal symptoms until March 14, when there was note of headache and neck stiffness, which subsided. Not until March 21 was lumbar puncture done. The cerebrospinal fluid was under great pressure and contained pus and meningococci. The blood culture was negative. Combined intravenous and intraspinal treatment was given and complete recovery ensued.

Such cases, by no means infrequent, very properly call in question the group of arthritic purpuras. Is it not possible that many cases of purpura rheumatica or Schoenlein's disease have been unrecognized meningococcemias? Is it not possible that many cases of Henoch's purpura have been a meningococcus sepsis in which the organism has failed to respond to ordinary cultural methods? This group of hemorrhagic diseases with symptoms of infection needs further bacteriological study.

MENINGOCOCCUS ARTHRITIS.

Type of arthritis.	A	B	C
Time of occurrence.	At onset.	Several days (averaging five) after onset.	After sixth day.
Joints involved	Symmetrical polyarthritis of wrists, knees, elbows, ankles; often almost all joints of extremities	One joint, usually knee	One or several.
Pathology . .	Hemorrhage into synovia or peri-articular tissues	Purulent arthritis.	Serous arthritis.
Bacteriology of joint exudate	Exudate not examined	Meningococci present in one-third of cases	Negative.
Pain . . .	Severe	Moderate	Moderate.
Redness . .	Marked	Slight or absent	Moderate.
Swelling . .	Slight or absent	Marked	Moderate.
Tenderness . .	Marked	Slight	Moderate.
Spasm . . .	Marked	Slight	Moderate.
Type of infection . . .	Severe, grave or fulminating	Mild or moderately severe	No relation.
Skin symptoms	Hemorrhagic rashes constant	Inconstant	Urticaria, erythema.
Duration . .	Short	Prolonged	Short.
Complications .	Panophthalmitis, epididymitis, etc.	Infrequent	Serum sickness.
Prognosis . .	Poor	Good	Good.
Treatment . .	General, largely serotherapy	Local, aspiration if indicated; local serum injections	Rest and time.

TYPE I.—ARTHRITIS.

M. F.—Herniotomy, May 7, 1918. Meningitis, July 8. Profuse petechial rash. July 9, redness, swelling, tenderness, pain in

right wrist. July 12, both wrists and left knee involved. Arthritis disappeared July 20. Serum: intraspinally, 290 c.c.; intravenously, 505 c.c. Recovery.

J. S.—Onset, December 3, 1917, with malaise, tonsillitis and petechial eruption. December 5, meningitis. December 6, acute polyarthritis appeared, with redness and swelling of wrists, elbows and knees. Duration, forty-eight hours. Severe course. Serum: intraspinally, 215 c.c.; intravenously, 105 c.c. Recovery.

O. C.—Admitted November 9, 1917, with measles. November 27 had acute polyarthritis following a chill. A profuse petechial rash appeared, also meningitis. The right shoulder and small joints of the left hand remained acutely painful, red and swollen for a number of days. Serum: intraspinally only, 135 c.c. Recovery. Symptoms subsiding December 18.

S. C.—Admitted December 21, 1918, with severe type of infection and petechial rash and soreness and stiffness in many joints without effusion. Developed left panophthalmitis and parotitis. Serum: intraspinally, 190 c.c.; intravenously, 75 c.c. Recovery.

J. C.—Admitted January 14 with a history of pain and aches all over for four days. A petechial rash was present. January 16, both wrists and right knee became swollen, red and tender. There was pain in other joints, but without tenderness or other signs. Developed panopthalmitis and acute hydrocephalus. Serum: intraspinally only, 310 c.c. Death. Autopsy, No. 18–A34.

W. E.—Admitted December 18, 1917, with a gradual onset, after measles, of aching in arms, back and legs. On admission there was arthritis of the right elbow, both knees and both ankles. December 24 there was moderate effusion in the knees with swelling and tenderness. Bilateral panophthalmitis developed. Serum: intraspinally only, 95 c.c. Death six days after onset. No rash was noted.

R. T.—Attendant in meningitis ward. Admitted December 26, with history of a cold in the head for three days. Marked petechial eruption present. December 27 developed an arthritis of the right ankle and left knee. Knee aspirated, no organisms found. Cell count in exudate 14,000. Developed panophthalmitis. There was a positive blood culture. Meningitis not present. Serum: intraspinally, 0; intravenously, 600 c.c. (approx.). Death, February 13. At autopsy meninges normal. Last mention of arthritis January 8.

A. M. H.—Head nurse in meningitis ward. Tonsillitis, January 16, 1918. Sinusitis, January 23. January 25, acute polyarthritis began. There was only moderate stiffness, swelling, pain and tenderness in hips, knees, ankles, elbows and wrists. This soon subsided and the nurse returned to duty. February 11, the sinuses were drained with a trocar. This was immediately followed by chill, serious prostration, fever and severe polyarthritis. A maculopapular eruption was present. Blood culture, February 16, showed

meningococci. Intensive intravenous treatment was begun. In five days the symptoms disappeared. Returned to full duty April 1. No meningitis.

TYPE 2.—ACUTE MONOARTHRITIS.

E. S.—Admitted December 1, 1918, with severe meningitis. December 19, developed arthritis of both knees, with a purulent gelatinous yellowish exudate, containing meningococci. Panophthalmitis. No rash mentioned. Serum: intraspinally, 85 c.c.; intravenously, 75 c.c. Recovery.

E. S.—Following tonsillitis was admitted December 17, 1917, with severe type of infection, a petechial rash and panophthalmitis. December 22, developed arthritis of the left knee. A purulent fluid was aspirated. No organisms were found. Blood culture was not made. Serum: intraspinally only, 110 c.c. Recovery.

J. H.—Admitted October 13, with petechial rash and purulent meningococcus conjunctivitis, with corneal ulceration. Epididymitis. October 16, had arthritis of the right ankle, with swelling, redness and effusion. Phlebitis of the right-arm vein also present. No meningitis. Serum: intravenously, 230 c.c. Recovery.

L. McR. (colored).—Admitted October 11, 1918, comatose, in serious condition, with conjunctival petechiæ. October 20, purulent arthritis of the left knee appeared. October 24, 20 c.c. purulent fluid was aspirated showing large numbers of extra- and intercellular Gram-negative organisms. Serum: intraspinally, 100 c.c.; intravenously, 100 c.c. Recovery.

M. P.—Admitted May 28, 1918. A moderately severe infection, with erythematous and petechial rashes was noted. Arthritis of the left knee appeared June 2, with pain, tenderness and effusion and a small area of redness over the internal aspect. 70 c.c. of moderately purulent fluid were removed by aspiration. Meningococci were present. Recovery complete. Serum: intraspinally, 30 c.c.; intravenously, 365 c.c.

C.—Measles, July 15, 1918. July 25, developed meningitis of severe type with petechial rash. July 28, developed acute arthritis of the right wrist, which subsided in forty-eight hours. Bilateral parotitis. Serum: intraspinally, 195 c.c.; intravenously, 320 c.c. Recovery.

J. W.—Admitted, January 23, 1918, with a severe type of infection. February 4, showed arthritis of both knees. 60 c.c. straw-colored fluid aspirated from the left knee. February 7, 40 c.c. fluid aspirated from the right knee. No organisms found in joint exudate. Patient developed hydrocephalus and gangrene of the toes. Serum: intraspinally, 95 c.c.; intravenously, 600 c.c. Death.

W. W.—Admitted March 26, 1918, with petechial rash. March 29, there was effusion in the left knee, with pain and tenderness. Aspiration gave 35 c.c. of a semipurulent, yellowish-green fluid.

Serum was injected into the joint. The fluid showed a large number of pus cells but no organisms. The right hip became involved April 1, with much swelling. Arthritic symptoms lasted about four weeks. Serum: intraspinally, 135 c.c.; intravenously, 255 c.c. Recovery.

R. H. F.—Admitted November 17, with severe type of infection and petechial rash. November 22, arthritis of the left wrist, left ankle and right knee appeared, with much effusion in the knee-joint. Serum: intraspinally only, 130 c.c. Recovery.

L. R.—Admitted December 26, 1917, very ill with petechial rash. January 7, developed bronchopneumonia and pericarditis. January 9, an acute arthritis of the right shoulder. Epididymitis and acute hydrocephalus were complications. Serum: intraspinally, 365 c.c.; intravenously, 130 c.c. Death.

E. R.—Admitted February 6, seriously ill with petechial rash. February 8, had arthritis of the right knee. February 14, fluid in knee aspirated, 7 c.c. of yellow, cloudy fluid obtained, pus cells abundant, no meningococci. Serum: intraspinally, 90 c.c.; intravenously, 260 c.c. Recovery.

J. W.—Onset, December 4. Admitted to hospital December 5 in serious condition, with petechial rash and meningitis. Developed arthritis in right knee December 23. This cleared up largely by January 1. January 6, had recurrent arthritis, with meningococci in the exudate. January 7, examination of fluid of knee showed pus cells and a few extracellular meningococci. Serum: intraspinally, 135 c.c.; intravenously, 35 c.c. Recovery.

J. G.—Admitted November 28, 1918. A serious infection, with petechiæ and purpura. December 4, arthritis of right knee developed; 50 c.c. of greenish-yellow pus was aspirated and 15 c.c. of antimeningococcus serum injected. There was a temperature from the arthritis, which cleared up December 13. Blood culture was positive. Serum. Recovery.

N. J.—Admitted December 17, in serious condition, with thickly set petechial rash. December 22, the right knee became tender and distended with fluid; 70 c.c. of yellow, oily, purulent fluid was aspirated, containing large sediment of pus cells without organisms. Marked stiffness and limitation of motion in joint when transferred to orthopedic service.

H. C. L.—Onset, April 19, with "aches in all bones." Entered hospital April 20, with profuse hemorrhagic eruption. Meningitis developed twenty-four hours later. Epididymitis was a complication. April 26 arthritis of left hip and knee, with local pain, redness and tenderness and moderate swelling. Serum intraspinally, 85 c.c.; intravenously, 445 c.c. Recovery.

A. O. K.—Admitted April 15, 1918, developed a petechial rash April 16. April 19 had severe pain in the left wrist with swelling, which subsided in forty-eight hours. Epididymitis was a complication. Serum: intraspinally, 110 c.c.; intravenously, 480 c.c. Recovery.

CONCERNING ASCENDING RENAL TUBERCULOSIS.[1]

By Leo Buerger, M.D., F.A.C.S.,
NEW YORK.

There is almost a consensus of opinion today regarding the preponderance of the incidence of primary renal tuberculosis, with secondary descending infection of the ureter and bladder, authentic cases of primary involvement of the distal portions of the urinary tract being relatively rare. Some authors dispute the validity of the arguments of those who believe that ascending infection of the ureter and kidney can occur. It is our purpose in this paper to present some of our own clinical and pathological observations, as well as cystoscopic findings, that support strongly the contention of those who, admitting the rarity of the *ascending modus* of infection, still believe that it may obtain in a small percentage of the cases.

Experimentally a number of authors, among whom may be mentioned Albarran, Bernard and Wildboldz, have proved the possibility of producing a tuberculous infection of the kidney by way of the ureter. In order to bring about this result, however, a complex of conditions has to be complied with, such as can rarely be realized clinically. Bauereisen, basing his conclusions upon very thorough and experimental researches, contends that an ascending lymphogenic infection of the wall of the ureter is possible. However, the proofs submitted by authors of this school are not sufficiently convincing to be accepted.

In conflict with the views of the partisans of the "ascending modus" of infection may be cited anatomical findings in the kidney that refute seemingly strong evidences of primary bladder involvement. Thus profound vesical ulcerations and lesions, marked involvement of the lower ureter, with ulcerative and massive cheesy infiltration, associated with a dilated ureter above, but with very superficial changes—all these, although speaking in favor of a primary vesical tuberculosis, with ascending process, involving, first, the lower ureter, and then to a lesser degree the upper—can, in no sense, be accepted as proving the *ascending theory*, since it inevitably will be found that in practically all the cases described *old lesions of the corresponding kidney already exist.* It is therefore with considerable truth that Halle and Motz reply to the sponsors of the ascending theory. "We have still to find profound ureteral ostial lesions at the bladder, with complete integrity of the corresponding kidney."

[1] Read before the Genito-urinary Section, New York Academy of Medicine, May 21, 1919.

In short, whenever a kidney shows extensive or old lesions the mere finding of more extensive ulcerations in the inferior or distal ureter, or more extensive pathological destruction in the lower ureter than in the upper, cannot be regarded as offering testimony in favor of the ascending theory, since we know only too well that dependent portions, such as the lower ureter, may, by reason of the accumulation of tubercle bacilli and tuberculous products, and by virtue of the stagnation that can occur at this point, evidence alterations of greater extent than portions of the tract that have been involved for even greater periods of time.

There are, however, a number of reported cases in the literature that are in keeping with the cases that we shall report in this paper and that give more reliable and more conclusive evidence in favor of the validity of the ascending theory and which demonstrate that this modus of infection may obtain. Thus Wildbold reports the following case: The bladder, ureter and pelvis of the kidney tuberculous, *without any lesion in the parenchyma of the kidney.*

Hottinger cites the following case: Extensive involvement of the bladder and prostate; left ureter involved only at its inferior extremity, with the pelvis and the kidney itself healthy.

Although these cases definitely prove the possibility of the occurrence of ascending infection, the paucity of such observations testifies also to the rarity of this modus of infection.

As for the clinical observations that speak in favor of ascending infection, there are a number of types which could be mentioned. Probably most numerous are those cases in which the healthy sister organ becomes infected by the ascending route, the other kidney, ureter and bladder having been previously involved.

More rarely we may assume that reflux of urine into the ureter may obtain—this possibility being demonstrated clinically and pathologically—the involvement of the ureter then being secondary to a bladder infection, which in turn may supervene after a primary involvement of the prostate and testicles.

And then it is well known there are cases of congenital dilatation of the whole urinary apparatus in which cystoscopy demonstrates dilated and very much enlarged ureteral orifices and in which cystography, combined with ureterography and pyelography, have shown the existence of patency of the ureters and their wide communications with the bladder. In such cases not only are anatomical conditions given for the occurrence of ascending infection, but my own observations have proved to me that secondary ureteral and renal pelvic tuberculosis can occur.

Other clinical testimony in favor of the occurrence of the ascending infection is recorded by Rovsing, who described at the First International Congress of Urology six cases in which he had found dilatation of the ureter and pelvis of the kidney above a tuberculous stenosis of the lower end of the ureter, with progressive develop-

ment of lesions *from below upward*. In his cases the cause of the ureteral stricture varied, the primary focus being situated in the prostate, with secondary involvement of the bladder, and then the ureter.

According to some authors, among whom may be mentioned Rafin, the view is expressed that clinically tuberculosis of the bladder does not exist except in connection with renal tuberculosis. My own clinical observations, however, have demonstrated to me that we must accept the possibility of the incidence of primary tuberculosis of the bladder, although the integrity of both kidneys is difficult to prove in those cases in which exploratory operation has not been performed, and although the number of cases in which nephrectomy was done and in which the ascending modus seems to be definitely shown is a small one.

In short, from the literature one would say that the results of animal experimentation, studies of pathological specimens and investigations along clinical lines offer indisputable evidence that the ascending modus of infection may obtain, although when the cases are carefully analyzed and compared with the numbers belonging to the descending class their paucity and rarity is astonishing, to say the least.

It may be well, therefore, to add several cases from my own case records, which cast some doubt on the general dictum, so widely accepted today, that a tuberculous bladder means a primary tuberculous kidney—cases that present, furthermore, points of diagnostic interest as well as valuable hints as to prognosis.

Certain cases have come under my observation that offer clinical and pathological evidence in favor of the assumption that *ascending infection* of the urinary tract with tubercle bacilli does occur.

The observations to be cited may be of some clinical as well as pathological interest, for they concern patients that evince the seemingly paradoxical phenomenon of a clinical cure or at least marked improvement of what *appears to be* the *primary* tuberculous focus when the secondary focus is removed. By this we mean that in two of our cases that presented marked bladder symptoms, with superficial tuberculous ulcerations, marked ureteral tuberculosis and infection of one kidney, either the pelvis alone being involved or associated with a minute parenchymal focus—most remarkable amelioration of the vesical lesions occurred after nephrectomy. So that after the removal of what appeared to be the secondarily involved renal focus the bladder symptoms disappeared completely, and even tubercle bacilli, whose presence had been demonstrated on several occasions before operation, could not be found several months after nephrectomy had been done.

This would appear to cast some doubt on the validity of the assumption that the bladder or some distant urinary part was primarily involved, but the pathological findings, as well as some of

the clinical observations, speak against this view, as will be seen by a close study of the history and the results of examination.

We must then assume that in our cases of ascending urinary tuberculosis the bladder could not take care of itself by reason of the fact that the ureter had been extensively involved and that possibly a small focus, secondarily produced in the kidney, was sufficiently large to form a storehouse for the accumulation and further propagation and distribution of the tubercle bacilli.

Let us briefly summarize some of the views regarding the inception of a tuberculous process in the urinary tract, alluding first to what is known as "the theory of primary invasion of the cortex of the kidney."

According to the views of some authors, among whom can be mentioned Koenig and Pels-Leusden, chronic tuberculosis of the kidney begins, in the majority of cases, with the formation of small cortical miliary tubercles that multiply, extend into the medulla and finally perforate into the pelvis of the kidney. The solitary or multiple tubercles that appear in the renal cortex early in the development of renal tuberculosis have no relation to the renal calyces or pelvis. Such foci may remain in the kidney for years without causing the appearance of tubercle bacilli in the urine.

More recent observations and studies, however, have demonstrated *this latter view to be incorrect.* In fact it has been shown that such tubercles are merely acute or subacute miliary tubercles of the kidney, that may arise shortly before death and whose further development is arrested by the death of the patient. In fact, most of the recent observations have definitely proved that chronic renal tuberculosis has its inception *most frequently* in the medulla, in some cases in the boundary zone between cortex and medulla and in other cases in the renal papillæ. Those foci which develop in the medulla seem to emanate from lesions of one papilla or in the transitional region between the calyx and papilla, often in the recesses of the calyx.

According to Wildboldz the following may be regarded as the first stages in the development of tuberculosis of the kidney.

In a kidney that is externally practically normal, with or without a small group of tubercles in the cortical zone corresponding to the site of the lesions, we see on cross-section of the organ a practically normal surface except for the changes in one or more papillæ. Thus in one or more papillæ, possibly some distance from each other, there develop smaller or larger yellowish nodules, with coagulation necrosis or breaking down in the direction of the renal pelvis, with the formation of an ulcer. Sometimes it is only the tip of a papilla that is involved, while at other times there may be merely a suggestion of a lesion at the tip of the papilla in the form of swelling, unusual pallor of the papilla, with a peculiar glossy alteration of the tissues. In other cases there may be found in a niche or recess of

the minor calyces an ulcer that lies partly in the calyx wall and partly over the margin or surface of the papilla. In later development we may find minute miliary tubercles arranged in a radiate manner in the pyramids corresponding to the involved papillæ.

On microscopic section we find miliary tubercles, with miliary or conglomerate agminated tubercles and some coagulation necrosis surrounded by a reactionary zone of lymphocytes, that usually extends toward the pelvis, where necrosis of the epithelium has taken place, with the formation of a cheesy ulcer.

It is from these small beginnings, the primary foci in the kidney itself, that we get all those vast destructive lesions in the kidney that are known so well—namely, the formation of tuberculous cavities; the conversion of the kidney into a tuberculous pyonephrosis; the secondary involvement of the renal pelvis, with miliary tubercles, conglomerate tubercles, cheesy deposits, indurated lesions, stenotic lesions, with retention of urine and inflammatory products in the pelvis of the kidney; the changes in the ureter; the secondary involvement of the bladder and of the distal urinary and sexual organs.

With these generally accepted views as to pathology in mind, the arguments in favor of the ascending theory offered by our cases may be better appreciated.

The following cases from my files are interesting examples of ascending renal tuberculous infection.

CASE I.—*Tuberculosis of the bladder; tuberculosis of the right ureter; minimal changes in the right kidney; tubercle bacilli obtained from the bladder and right kidney; vesical symptoms and tubercle bacilli disappear from the urine after nephrectomy.*

F. S., female, aged fifty-seven years, mother of eight children, consulted me on April 29, 1918, with the complaint that micturition was painful and very frequent, there being almost a constant desire to void.

These symptoms, the urgency, the pain on urination and the voiding in small quantities frequently, had been present for about four months. For the last four days blood had been present in the urine. There had been no noticeable loss in weight and no symptoms referable to the kidney other than an occasional ache in both lumbar regions, not partaking of the nature of renal colic and ill-defined in localization. Lately she has been voiding twice at night, and when in the direct posture she has almost a constant desire to void.

Cystoscopy (April 29, 1918). Examination of the bladder shows an irregularly shaped ulcer over the anterior wall not far from the sphincter, surrounded by inflamed mucous membrane. In this neighborhood there are a few follicles, suggestive rather of follicular cystitis than tuberculosis. Throughout the bladder there are

patches suggestive of cystitis en plaque, neither orifice showing anything suspicious of tuberculosis.

Both ureters were catheterized, the urine being almost clear from both sides, the right containing red blood cells but no pus.

Examination of the separated urinary specimens of the right and left kidney and bladder for tubercle bacilli showed the presence of tubercle bacilli in the bladder, and none in either the right ureter, right kidney or left kidney specimen.

In short, in this case the first cystoscopy suggested an ulcerative cystitis, with lesions very near the sphincter, over the roof of the bladder and anterior wall, because of the presence of an irregularly shaped superficial ulcer, together with the patchy cystitis.

Therefore, symptoms suggestive of a possible tuberculous ulcerative condition, with nothing strongly suspicious of primary involvement of either kidney, but with the finding of tubercle bacilli in the bladder specimen.

Cystoscopy (May 2, 1918). At this second examination both ureters were again catheterized, the specimens from the right side containing some blood, the specimen from the left kidney being negative. *Tubercle bacilli were present in the right kidney and bladder specimens.* The right ureteral orifice was seen to be somewhat irregular in shape, somewhat crenated, pus being absent in the renal specimens, although tubercle bacilli were found in the right kidney specimen.

In view of the absence of pus in the right kidney specimen, the negative left kidney specimen, the discrepancy between the meager findings in the right kidney, the extensive lesions in the bladder and the finding of tubercle bacilli, it was deemed advisable to do a third cystoscopy in order to obtain further light as to whether the right kidney was involved or not. It may be said that in order to prevent regurgitation of fluid from the bladder into either kidney specimen obtained through the ureteral catheter, it is always my practice to empty the bladder first thoroughly through the cystoscope while specimens are being collected from the kidney. Reflux or regurgitation backward into the ureters, therefore, could be ruled out as a factor in determining the presence of tubercle bacilli in either kidney specimen.

Cystoscopy (May 6, 1918). A third examination, therefore, was deemed advisable, since the role played by the right kidney in the pathological process at hand was not clear. It was decided therefore to collect at least four separate specimens from the right kidney during five-minute periods each, with the catheter in the pelvis of the kidney, in order to be absolutely certain as to the involvement of the right renal organ.

The report on the separated urinary specimens thus collected showed the *absence of tubercle bacilli* in all the left specimens, the presence of tubercle bacilli in the bladder and the presence of

tubercle bacilli in the second, third and fourth right kidney specimens, approximately collected during the second, third and fourth period of five minutes each, the first specimen having been discarded, inasmuch as contamination, due to the passage of the ureteral catheters through the bladder, must be ruled out in all such examinations.

In short, *in a case giving the typical bladder symptoms of renal and vesical tuberculosis, with superficial ulcerations in the bladder, with tubercle bacilli in the bladder urine, with an apparently normal left kidney,* and *with tubercle bacilli in the right kidney specimens on three different occasions, we were confronted with tuberculous lesions of the bladder, probably also of the right ureter and right kidney.* Cystoscopic findings spoke strongly against any marked involvement of the integrity of the right kidney, inasmuch as its functional activity was good and pus cells could not be obtained at any time from the pelvis of the right kidney itself.

Inasmuch as bladder irrigations that had already been tried before the patient had consulted me, and were again carried out under my supervision for a period of some two weeks, did not seem to ameliorate the condition, it was decided to do an exploratory operation upon the right kidney, in the hope that a primary focus could be found in this organ, although the urinary evidences were doubtful.

May 15, the right renal nephrectomy was easily carried out and a small organ, showing on its external surface no evidences of tuberculosis, was removed, in view of the fact that the ureter was thickened, particularly in its lower portion, the changes in it being sufficient to warrant the assumption that it was involved in a tuberculous process. Whether in the ascending or descending sense could not be determined.

The specimen when bisected seemed at first sight to be that of a perfectly healthy organ, but on closer inspection it was seen that there were at least three tuberculous foci of very small extent in the parenchyma. One of these, evidently a focus that in no way communicated with the pelvis, was about 3 to 4 mm. in diameter and suggested strongly confluent miliary tubercles and two additional smaller miliary tubercles were found in the cortex in a situation corresponding to that of the larger lesion. There were no ulcerations at the tips of the papillæ, but one suspicious minute tuberculous focus in one of the recesses of a calyx, which on microscopic examination was found to be a miliary tubercle of considerable size that had not as yet undergone cheesy degeneration and involved a calyx in one of its recesses, the section being very difficult to find, necessitating a large number of microscopic sections.

In short, there was no lesion macroscopically indicative of primary involvement of the kidney, but miliary tubercles without cheesy degeneration and not communicating directly with the pelvis.

The small size of the lesion, the absence of necrosis and absence of direct pelvic communication rule this out as being responsible for the lesions lower down in the urinary tract and for the presence of tubercle bacilli in the urine.

The pelvis showed a few scattered tubercles, while the ureter showed many more tubercles than the pelvis, their numbers becoming greater as the lower portion of the ureter was examined.

In brief, minimal secondary lesions in the kidney, few miliary tubercles in the pelvis, numerous tubercles in the ureter, with some areas of superficial ulceration and extensive lesions in the bladder.

These findings, it appears to me, are sufficiently characteristic to warrant the assumption that we were dealing here with a tuberculous process that had secondarily involved the kidney and the ureter, the most marked lesions being present in the bladder.

SUBSEQUENT CLINICAL COURSE. The patient made an uneventful recovery after nephrectomy, but the bladder symptoms persisted for some time. No treatment was prescribed for the bladder, as it was doubtful as to whether complete restitution to normal could take place, in view of the fact that the lesions of the kidney could hardly be held responsible for the lesions in the bladder.

During the summer of 1918 gradual improvement occurred, although a moderate amount of pollakiuria was still noted in September.

In October, 1918, she felt considerably improved and a cystoscopic examination was made on October 22. The ulcers had completely disappeared, the bladder showing marked improvement. The only lesions that could be detected were a moderate degree of redness, patches over the anterior wall near the sphincter, some follicular cystitis, the ureteral orifices being normal. *In short, disappearance of the ulcers and marked improvement.* October 23, *examination of the bladder urine failed to show the presence of tubercle bacilli.* Since then tubercle bacilli have been absent, and the patient in April, 1919, reports that she is practically well. Cystoscopy May 8, 1919, showed a bladder that could be regarded as almost normal.

Epicrisis. Enough data have been adduced in this case to strongly support the view that the involvement of the kidney was secondary to a process lower down in the urinary tract. Whether the renal lesions are secondary embolic invasions through the blood stream or in the true ascending sense cannot be determined. Certain it is, however, that they are of more recent date than the bladder lesions. What, however, is not so clear is how the nephrectomy could possibly have influenced the vesical process so rapidly, not only in contributing to the disappearance of the ulcers, but also in causing the absence of tubercle bacilli in the urine. Perhaps the following is the explanation. That by reason of the tuberculous

involvement of the distal part of the ureter and the marked relaxation and insufficiency of the vesical orifice a certain amount of reflux regularly occurs—that stagnation in the ureter follows—so that tubercle bacilli are present in the pelvis rather by virtue of reflux than either by secretion through the kidney or by reason of the breaking down of the tuberculous focus in the kidney itself. This would explain the finding of tubercle bacilli in all the specimens obtained from the kidney even though collected over a long period of time (twenty-five minutes), the lesions of the parenchyma of the kidney being too minute to warrant the belief that tuberculuria could possibly be due to their presence. With the removal of the kidney and a large portion of the ureter a closed focus or pouch in which tubercle bacilli could be secreted and retained was eliminated and the bladder then was able to take care of itself. It is only in this way that we can explain the paradoxical result that followed the removal of a kidney with such insignificant minute minimal lesions.

The second case to be cited was even more striking in its offering of pathological evidence, that ascending tuberculosis of the urinary tract occurred. A kidney obtained at nephrectomy was slightly hydronephrotic, the pelvis showing extensive miliary tuberculosis, the parenchyma of the kidney being free except for a very few scattered miliary tubercles, these being visible after the capsule of the organ was stripped.

Case II.—*Extensive ulcerative tuberculosis of the bladder; left-sided pyuria; tubercle bacilli in the specimens from the left kidney and also in the bladder, in a patient suffering from marked frequency of urination, dysuria, with occasional attacks of pain in the left hypochondriac region, nephrectomy showing a somewhat hydronephrotic kidney with tuberculosis of the pelvis, the parenchyma being free except for a few miliary tubercles.*

A. E., female, aged sixty-seven years, consulted me on July 12, 1918, having been referred by Dr. P. Friedman, with the following history:

There had been attacks of pain in the left hypochondrium for about one year, the pain radiating to the left lumbar region and downward into the bladder; increasing urinary frequency, so that she frequently had incontinence during the day, voiding four to five times at night. Lately clots of blood had appeared in the urine.

Cystoscopy (July 12, 1918). Extensive ulcerations were found, and polypoid edema about the left ureteral orifice. The specimens from the right kidney were clear. Indigocarmin appeared in moderate concentration in the right kidney specimens. The left kidney specimens were cloudy, with a practically negative output of indigocarmin.

On microscopic examination numerous pus cells were found in the left kidney specimens, the right specimens being clear, tubercle bacilli being found in the left kidney specimen and bladder.

Tentative Diagnosis. Tuberculosis of the left kidney and bladder.

The patient refused operative intervention until September, 1918, when, in view of the persistence of symptoms, acquiescence was obtained.

Nephrectomy (September 20, 1918). Through the usual oblique incision (Albarran) a somewhat enlarged kidney was liberated from adhesions, the external surface evidencing no sign of tuberculous lesions. The pelvis, however, was markedly dilated (hydronephrotic), considerably thickened and evidently tuberculous. The ureter was also found very much thickened; in its lower portion, sclerotic and indurated; in its upper, dilated.

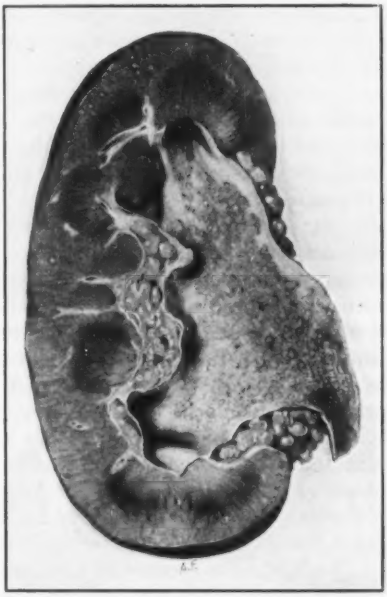


FIG. 1.—Renal pelvic tuberculosis showing an unusual type of ascending tuberculosis in which the pelvis was diffusely involved with miliary tubercles, the kidney being practically negative, except for a few small miliary tubercles seen in the upper pole and in the tissue of the mid-portion of the kidney.

The Pathological Specimen. On careful examination the kidney itself was found somewhat hydronephrotic, the extrarenal pelvis being particularly dilated. Careful examination of all the papillæ and the cortex *revealed absolutely no evidences of tuberculosis.* On stripping the capsule, however, a number of miliary tubercles, possibly seven or eight in all, were discovered, one of these showing tuberculosis on microscopic section.

The interior of the pelvis was diffusely tuberculous, in places

showing discrete tubercles, but for the most part covered by myriads of tubercles fusing with each other (Fig. 1) and becoming more and more marked in the distal direction, the upper ureter region being extensively diseased, the ureter itself markedly thickened. The lower portion of the ureter showed marked indurative tuberculosis, with superficial tuberculous ulcerations.

In short, we have here a case in which the tuberculous lesions of the bladder were very marked, ulcers and polypoid edema being present, in which the ureter gave evidences of an extensive old tuberculous process, with some narrowing at its lower end, with consequent dilatation of the extrarenal pelvis, the latter showing extensive miliary tuberculosis. *The absence of tuberculous lesions in any of the papillæ, in the calyces and in the peripheral portions of the pelvis, the freedom of the renal parenchyma* (except for a few miliary tubercles) *seem to present sufficient evidence in favor of the assumption that here we were dealing with an ascending tuberculous process.*

The patient made an uneventful recovery after nephrectomy.

Future Course. The bladder symptoms rapidly disappeared, so that on May, 1919, the patient reported herself practically well.

While these two cases illustrate what we may regard as indisputable instances of ascending tuberculous infection, *there are certain other unusual cases of renal tuberculosis, that might be incorrectly assumed to belong to this class.* These are the cases in which the focus in the kidney is relatively minute, takes the form of a small ulcer of the pelvis, or of a calyx, or is represented by a cheesy plaque in one of the terminal recesses of a calyx wall. Be these lesions ever so small, however, they must be regarded as indicative of primary involvement of the kidney, for they never fail to show evidences of being of considerable age, are always disintegrated, cheesy foci from which the propagation of the tuberculous process downward takes place.

Thus in the following case to be cited, Fig. 2 shows an old and cheesy lesion of the mucosa of a calyx, while Fig. 3 is an example of a still older zone of coagulation necrosis of mucous membrane of a calyx in another case reported elsewhere by me.[2]

CASE III.—*Descending tuberculosis of the kidney simulating ascending tuberculosis; minimal renal lesions; practically intact renal parenchyma; minute lesions in calyces; diseased pelvis; extensive tuberculous ureteritis and cystitis.*

N. S., aged thirty-eight years, male, was admitted to the surgical service of the Mount Sinai Hospital, under my care, in July, 1917, with the usual symptoms characteristic of tuberculosis of the kidney and bladder—namely, frequency of urination, burning on urination, nocturia lasting for about six months and the passage of cloudy, purulent urine containing tubercle bacilli. On cystoscopic exami-

[2] New York Med. Jour., January 5, 1918.

nation, July 26, 1917, I found the usual lesions of tuberculosis in the bladder, polypoid edema about the right ureter and slight retraction in this region. Both kidneys functioned well, as evi-

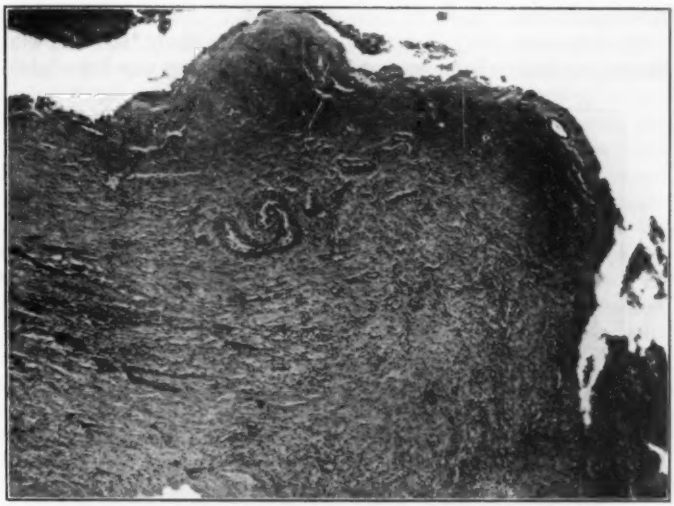


FIG. 2.—Necrosis of mucosa of a calyx, the only tuberculous lesion found.

FIG. 3.—Coagulation necrosis of mucous membrane of a calyx (on the right).

denced by the output of indigocarmin, and a small number of white blood cells were found in the specimens obtained from both kidneys; but tubercle bacilli were found only in the specimens from the right kidney. A diagnosis of right renal and vesical tuberculosis was made.

On August 4, 1917, I did a typical nephrectomy, the following interesting lesions being encountered: The kidney was but slightly

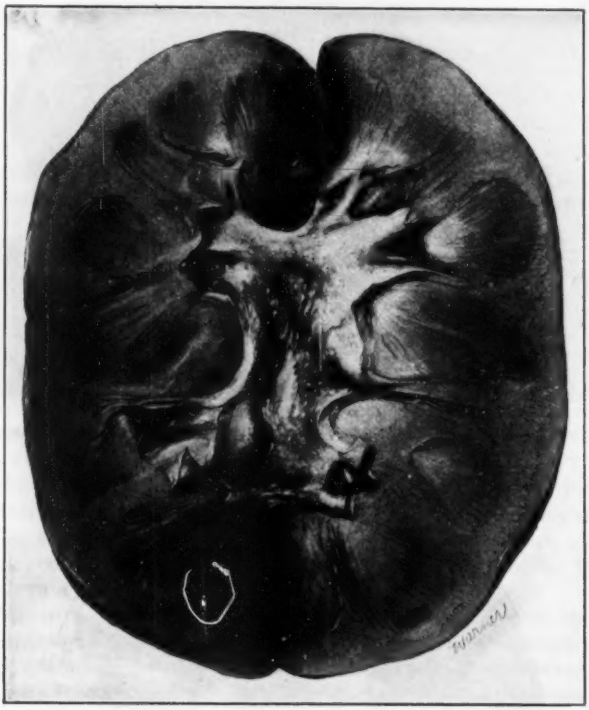


FIG. 4.—Apparently intact kidney, with no gross surface lesions suggestive of tuberculosis, harboring small lesions in the calyces, and showing a thickened granular pelvis.

adherent, fairly movable, about normal in size, with no gross evidence of tuberculous involvement. The ureter was therefore palpated and was found densely adherent to the posterior parietes and surrounded by a mass of connective tissue, so firm in consistency that it appeared to be almost impossible of removal. With some difficulty a ureter as thick as a man's little finger was freed for a distance of about six inches, ligated and cut through, and the kidney was then removed,

It is the picture (Fig. 4) of this specimen of kidney pelvis and ureter with its seemingly normal parenchyma and its apparently extensive involvement of the pelvis of the kidney and ureter, that is worthy of consideration. This demonstrates the difficulty of macroscopic recognition of the lesions of renal tuberculosis.

On bisection of the kidney the only striking lesion that could be viewed with the naked eye was an intense inflammatory process involving the pelvis of the kidney and calyces, by virtue of which the pelvis was thickened to about three times the normal, its surface granular as if covered by a multitude of miliary tubercles, moderately reddened, but nowhere showing the lesions of tuberculosis, the small granules appearing much larger than those characteristic of miliary tuberculosis. No miliary tubercles could be seen in the parenchyma, nor were there any gross ulcerations of the apices of the papillæ. In short, macroscopically we had an apparently normal kidney with a very much thickened, inflamed and indurated pelvis and an enormously thickened ureter which, in a limited number of sections, showed nothing absolutely characteristic of tuberculosis.

It was not until a number of sections had been made through some of the hidden portions of the calyces, which had not appeared on bisection of the organ, that typical cheesy ulcerative lesions of tuberculosis were found. These involved a calyx without, however, showing any true miliary tubercles (Fig. 2).

These cheesy lesions should be regarded as absolutely characteristic of tuberculosis, when they are present in the kidney calyces, pelvis or ureter, and the diagnosis may be made even without the finding of endothelioid and giant cells. The photomicrograph represented in Fig. 2 shows a section through such a necrotic calyx. Above the mucous membrane is seen to be replaced by a zone of coagulation necrosis. The submucous connective tissue is markedly thickened by virtue of connective-tissue proliferation, and there are the cellular evidences of a chronic productive inflammatory process.

In a case of frank vesical tuberculosis, with tubercle bacilli in the urine and with typical lesions about the right ureteral orifice, we removed an enormously thickened ureter, doubtlessly tuberculous, and a kidney with minimal changes, changes insufficient for recognition by the surgeon at the operating table and requiring thorough investigation on the part of the pathologist for their detection.

Despite the preponderance of the infrarenal (ureterovesical) lesions here, we can safely adjudge the tuberculous process to have been developed in the descending sense.

If we compare the renal lesions in our cases of ascending tuberculosis with those mentioned as possibly giving rise to confusion in interpretation (as Case III), we will see, on the one hand, that in Cases I and II there was a tuberculous pyelitis associated with

discrete and in one instance confluent miliary nodules in the parenchyma, lesions that can be correctly estimated as of recent development, while, on the other hand, the lesions present in Case III (Figs. 2 and 3) are evidently very old, as evidenced by the extensive coagulation necrosis and the reactive fibrotic condition in the immediate neighborhood.

SUMMARY. We have given clinical and pathological proof of the occurrence of cases of ascending renal tuberculosis, ascending at least in the sense that the renal and ureteral lesions are secondary to the bladder involvement; we have shown that minimal tuberculous renal lesions, when associated with extensive vesical and ureteral changes, are doubtless, in some cases, later involvements of the urinary tract, be they produced in the true ascending, canalicular sense of propagation by contiguity or in a more circuitous fashion by late embolic invasion of the kidney; and, by the results of the removal of the kidney in two of the cases, have given ample testimony of the value of nephrectomy even in this type of urinary tuberculosis. Although the renal parenchyma is practically uninvolved in some of these cases the retention of tuberculous urine in the pelvis of the kidney and the constant contamination of the bladder with tuberculous products elaborated in the ureter are sufficiently active factors in interfering with recovery.

EFFECTS OF THE INJECTION OF ATROPIN ON THE PULSE-RATE, BLOOD-PRESSURE AND BASAL METABOLISM IN CASES OF "EFFORT SYNDROME."

BY CYRUS C. STURGIS, FIRST LIEUT., M.C., U.S.A.,
PENDLETON, OREGON,

JOSEPH T. WEARN, M.D., FIRST LIEUT., M.C., U.S.A.,
CHARLOTTE, N. C.,

AND

EDNA H. TOMPKINS,
CAMBRIDGE, MASS.

(From the Cardiovascular Division of the Medical Service, U. S. Army General Hospital No. 9, Lakewood, New Jersey.)

INTRODUCTION. During the studies upon the "Irritable Heart of Soldiers" at U. S. Army General Hospital No. 9, it was found that a considerable percentage of the cases were responding in a characteristic way to standard injections of epinephrin,[1] while others of the group reacted no more to the drug than did a normal individual. In patients sensitive to the drug there was in each

[1] Wearn, J. T., and Sturgis, C. C.: Effects of the Injection of Epinephrin in Soldiers with "Irritable Heart." (To be published.)

instance a rather marked increase in the pulse-rate. This effect on the heart-rate is probably due to the action of epinephrin on the accelerator fibers to the heart. In view of this fact, it was decided to study further the nervous control of the heart in soldiers with "effort syndrome," by observing the action of atropin sulphate on the vagus control.

The patients studied gave a history of the symptoms and signs of "effort syndrome" or "irritable heart," dating back in some of them to childhood, and in all of them a number of years. Some of them were epinephrin sensitive and others were not.

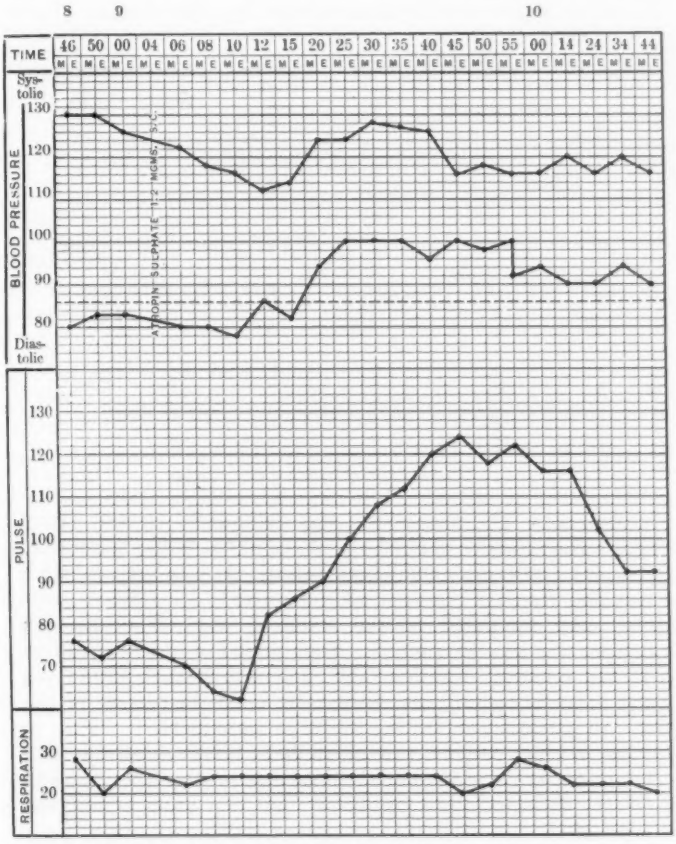


Chart showing the method of recording results after subcutaneous injection of atropin.

METHOD. The patient was rested in bed for one hour or longer until the pulse-rate and blood-pressure readings were constant.

Atropin sulphate, 1.2 mg., was then injected subcutaneously into the upper arm, and observations of the pulse-rate, blood-pressure and objective and subjective symptoms and signs were made every three minutes for nine minutes, then every five minutes for an hour or more if the effects of the drug were still present. The accompanying chart and Table I are illustrative of the method of recording results. In cases in which a simultaneous study of the gaseous metabolism was to be made the patients were fasted for twelve hours or more. Otherwise, they may or may not have fasted.

TABLE I.

Time.	Tremor.	Sweat.	Flush.	Pulsations.	Hands.	Miscellaneous.
8.46	+	Slight on palms	0	+	Warm	Quiet.
8.50	+	"	0	+	"	"
9.00	+	"	0	±	"	"
9.04		Atropin	sulphate, 1.2 mgm. s. c.			
9.06	+	Slight on palms	0	±	"	"
9.08	+	"	"	"	"	"
9.10	+	"	"	"	"	"
9.20	+	"	"	"	"	"
9.25	+	"	"	"	"	"
9.30	+	Very slight	"	"	"	"
9.35	+	0	"	"	"	"
9.40	+	0	"	"	"	"
9.45	+	0	"	"	"	"
9.50	+	0	"	"	"	"
9.55	+	0	"	"	"	"
10.00	+	0	"	"	"	"
10.14	+	0	"	"	"	"
10.24	+	0	"	"	"	"
10.44	+	0	"	"	"	"

METABOLISM. The metabolism was determined by the Tissot method. The patient's expired air was collected in the spirometer by means of a half-mask and Tissot valves. It was analyzed with the portable Haldane gas-analysis apparatus. All volumes were collected and computed in the standard way. The nitrogen metabolism was not determined. Each period of a determination was of ten minutes' duration, and, unless it started within ten minutes of an injection, was made with a new placement of the mask. All patients were fasting twelve or more hours.

In cases in which patients were unfamiliar with the apparatus, two basal periods were carried out; but since most of the cases had had satisfactory determinations previously, but one basal period was run ordinarily.

RESULTS. We have injected 1.2 mg. atropin sulphate into 10 normal men and into 21 soldiers with "irritable heart," and noted the following effects: In the normal men, following the injection of the drug, there was an immediate drop in pulse-rate

in 9 of the 10 subjects. This drop was followed immediately by a rise in the pulse-rate varying from six to thirty beats per minute.

In 9 of the 10 normal subjects there was an increase in the diastolic blood-pressure, and 8 showed a drop in systolic blood-pressure. All of the normal men showed a drop in pulse-pressure. This drop in pulse-pressure occurred before the maximum increase in pulse-rate in 6; in 2 others it followed the maximum rise, and in the remaining 2 it occurred simultaneously with the maximum increase in pulse-rate.

TABLE II.—SHOWING PULSE-RATE CHANGES AND THEIR RELATIONS TO INJECTIONS OF ATROPIN SULPHATE IN SOLDIERS WITH "IRRITABLE HEART" OR "EFFORT SYNDROME" AND IN NORMAL MEN.

	Number of subjects.	Number showing drop in pulse-rate.	Average maximum drop in pulse-rate.	Number showing increase in pulse-rate following the drop.	Average time of beginning increase in pulse-rate after injection.	Average maximum pulse-rate increase.	Average time of maximum pulse-rate increase after the injection.
Cases of Effort syndrome	21	19	10 beats per min.	20	8 min.	30.4 beats per min.	37.4 min.
Normal men .	10	9	10.2 beats per min.	9	10.5 min.	21.8 beats per min.	39 min.

TABLE III.—SHOWING CHANGES IN BLOOD-PRESSURE FOLLOWING INJECTION OF ATROPIN SULPHATE INTO SOLDIERS WITH "IRRITABLE HEART" OR "EFFORT SYNDROME" AND INTO NORMAL MEN.

	Number of subjects.	Number showing a rise in diastolic blood-pressure.	Average rise in diastolic blood-pressure.	Number showing drop in systolic blood-pressure.	Number showing rise in systolic pressure.	Number showing drop in pulse-pressure.	Average drop in pulse-pressure.
Cases of Effort syndrome	21	20	11.9 mm. mercury	11	10	14	14.5 mm. mercury
Normal men .	10	9	7.8 mm. mercury	8	0[1]	10	10.8 mm. mercury

There was little difference in the response of the "effort syndrome" cases to the drug. As is shown in Tables II and III the most noticeable differences are the greater increase in pulse-rate

[1] Two showed no change in systolic blood-pressure.

in the cases with "effort syndrome," and the fact that on the average the increase in rate began sooner than it did in the normal controls.

The changes in blood-pressure were about the same in both groups. One rather striking change which was common to both groups was the fact that the compensatory drop in pulse-pressure was caused more by a rise in the diastolic than by a fall in the systolic blood-pressure. This rise in diastolic pressure varied from 4 to 25 mm. of mercury.

In the "irritable heart" cases and in the normal controls, dilatation of the pupils was noted, and dryness of the mouth was frequently complained of.

METABOLISM RESULTS. Higgins and Means[3] reviewed the literature upon the respiratory exchange under atropin and added the reports of studies upon themselves as normal subjects. They concluded there was a slight elevation in metabolism and an increased dead space due to dilatation of the bronchi after therapeutic doses of atropin.

The metabolism was studied by us in 6 cases under the effects of atropin. The time interval between the injection and the metabolism determination depended upon the pulse curve after the administration of the drug. In 4 of the cases a period was taken shortly after the injection, at the time of the pulse depression which ordinarily precedes the later rise. Two of these showed a small drop in the heat production and two showed rises so slight as to be within the upper limit of error. They gave no noteworthy change in respiratory rate, volume or quotient.

In each case one period was run as nearly as possible at the time of the greatest pulse acceleration. Under that condition three of the patients showed a small drop in the metabolism and three no change worthy of mention. This is interesting in view of the often discussed problem of how great a part increased heart activity plays in the elevation of metabolism under various conditions, and may be of some value as partial evidence that the increase in metabolism that occurs after epinephrin injection is not due to acceleration of the pulse. The respiratory quotient dropped slightly in each case. The respiratory rate and volume did not vary beyond a normal basal limit. Table IV summarizes these results.

SUMMARY. In cases of "irritable heart" and in normal men after injection of atropin sulphate there was generally a preliminary drop followed by an increase in pulse-rate. This increase was greater on the average in the "irritable heart" cases than in the normal controls. There was also a drop in pulse-pressure in the majority of the subjects, dependent upon a rise in diastolic blood-

[3] Jour. Pharmacol. and Exper. Therap., 1915, vii, 1.

TABLE IV.

Case No.	Name.	Age.	Height.	Weight.	Period No.	Minutes from injection to period start.	CO_2 per min.	O_2 per min.	R. Q.	Pulse.	Resp.	Vol. per min. S.T.P.D.	Vol. per resp.	Cal. per sq. meter per hour.	Metabolism, per cent. from normal.	Amount of metabolic change.
			Cm.	Kg.			C.c.	C.c.					C.c.			
1	G. A.	24	174	68.4	1–2	..	212	251	0.85	75	14.6	5.76	396	39.9	+ 1	
					3	5	198	241	0.82	59	14.3	5.29	371	38.1	− 4	− 5
					4	37	203	246	0.83	99	14.0	5.51	394	39.0	− 1	− 2
2	D. C.	26	177	64.1	1	..	211	260	0.81	59	13.3	5.45	411	41.7	+ 6	
					2	3	211	269	0.78	59	15.5	5.54	358	42.9	+ 9	+ 3
					3	45	214	273	0.78	92	15.7	5.61	357	43.4	+10	+ 4
3	R. D.	23	173	51.6	1	..	185	209	0.89	70	12.4	4.92	398	38.2	+ 3	
					2	17	176	210	0.84	102	12.3	4.74	387	38.0	+ 4	+ 1
4	E. G.	24	165	58.9	1–2	..	194	238	0.82	70	11.4	5.57	491	41.7	+ 6	
					3	3	201	247	0.81	64	11.2	5.67	508	43.3	+10	+ 4
					4	28	171	225	0.76	91	11.5	5.02	436	38.8	− 2	− 8
5	M. L.	19	167	62.0	1	..	195	229	0.85	76	16.1	5.72	355	38.8	− 2	
					2	46	170	217	0.78	97	13.8	5.02	363	36.2	− 8	− 6
6	H. R.	24	169	60.2	1–2	..	201	264	0.77	69	31.2	7.31	236	44.8	+13	
					3	3	190	248	0.77	64	40.8	8.57	210	42.2	+ 7	− 6
					4	42	189	251	0.75	103	31.5	7.97	253	42.4	+ 7	− 6

pressure in the majority of cases and upon an additional drop in systolic blood-pressure in some of the cases.

There was no increase in basal metabolism after the subcutaneous injection of atropin sulphate.

There was a slight fall in the basal metabolism in three of the six cases studied.

There was always a slight drop in the respiratory quotient.

POINTS OF DIFFERENTAL DIAGNOSTIC VALUE IN PULMONARY ABSCESS, BRONCHIECTASIS AND PULMONARY TUBERCULOSIS, WITH AN EXPLANATION OF THE CAUSE OF THE DIFFERENCE IN AUSCULTATORY FINDINGS.[1]

By Francis Marion Pottenger, A.M., M.D., LL.D.,
MONROVIA, CALIFORNIA.

Pulmonary abscess, bronchiectasis and pulmonary tuberculosis are very often wrongly diagnosed. Unless one has had considerable opportunity to examine patients suffering from each of these diseases, he is liable to experience considerable difficulty in differentiating them. If, however, a careful study of the disease and the manner in which it affects the patients is made the differentiation will not be so difficult. Both pulmonary abscess and bronchiectasis are often diagnosed as tuberculosis on the basis of cough and expectoration. The fact that bacilli are not found is no longer sufficient to prove the non-tuberculous nature of a pulmonary process; consequently, this fact confuses more than it helps. In my own work I have had opportunity to study numbers of patients who were expectorating large quantities of sputum. Some of these have been of a tuberculous nature, yet bacilli have been found only at rare intervals. In other patients who had had a definite tuberculous process which had been accompanied by cavity formation and sputum containing bacilli the general process healed, leaving a secreting cavity, with a considerable amount of expectoration in which tubercle bacilli were not found, even after repeated examination. So while the presence of tubercle bacilli shows the definite tubercular nature of sputum, their absence does not prove the process to be non-tuberculous.

Clinical History. Pulmonary abscess usually follows acute infection of the lung, in which such organisms as streptococci, staphylococci or the pneumococci are the etiological factors, such as have been common during the epidemics in both army and civil life during the past two years. It also follows operations on the

[1] Read before the Annual Meeting of the American Climatological and Clinical Association, at Atlantic City, June 14, 16 and 17, 1919.

teeth, tonsils and nasal cavities now and then, the infectious material being aspirated into the lungs, where it becomes implanted, and is followed, from a few days to a week or two later, by an acute abscess. I am led to believe that abscesses having this etiology are more common after tonsil operation than is generally believed. I have seen more than twenty during the past year and a half, and other observers, as Manges[2] and Richardson,[3] report cases which have come under their observation. These abscesses always furnish a history of acute onset; expectoration, sometimes foul smelling, usually profuse at first, varying in quantity later; quite often periodical rises of temperature, and sometimes bloody expectoration. Clubbing of the fingers usually comes on quickly. I have seen it very pronounced in abscess following tonsillectomy in less than three months after the abscess formation, and have noted it as early as six weeks.

The most common form of pulmonary abscess that clinicans deal with today is that which followed the recent influenza epidemic. The abscess is usually found in the lower half of the lung and is often situated in fibrous tissue which has resulted from the infection. Not uncommonly a complicating pleurisy was present which has resulted in pleural adhesions and thickening. Prior to the recent epidemic the type of abscess which was most common in my practice was the one following operations on the upper respiratory tract. It was only occasionally that I saw one following an acute respiratory infection.

Bronchiectasis, as I have observed it, usually follows a pneumonia in childhood, although I have seen it follow the same in a few instances in adolescence and early adult life. It sometimes seems to begin with a bronchitis and persists as a chronic form of this affection. I have rarely seen it begin in those past middle life unless it was of a tuberculous nature. The patient usually gives a history of cough which continued after a pneumonia or after a bronchitis as before mentioned. Oftentimes cough, with expectoration, has persisted since the pneumonia; at other times it has appeared only when the patient had, what was termed a "cold." If the process follows chronic bronchitis it also shows periods of exacerbation. Temperature may be present occasionally and the sputum is at times bloody. The cough in most of my cases has been loose, indicating that the sputum is in the larger tubes, where it is easily moved. The loose nature of this cough itself has proved of diagnostic worth. A history of cough with expectoration, following and persisting after a pneumonia in childhood, is of itself nearly sufficient for the diagnosis of the postpneumonic type. The fingers are often clubbed, but in my experience this sign is not as important as in

[2] Jour. Am. Med. Assn., May 8, 1915, p. 1554.
[3] Abscess of the Lung following Operation on the Tonsils and Upper Air Tract, The Laryngoscope, St. Louis, Mo., July, 1916.

pulmonary abscess. It is neither as constant nor does it appear as quickly.

Pulmonary tuberculosis with cavity gives a very different history. As a rule, the patient forms an abscess cavity of a tuberculous nature only after the disease has existed as a clinical entity for some time, although now and then we see a sudden onset with cavity following in a short time. Occasionally a mistaken diagnosis is made and the acute signs in the lung at the time of the formation of the cavity are taken for pneumonia. A careful study of the clinical history will often aid in differentiating these processes. Cavity formation in tuberculosis is more liable to be preceded by repeated attacks of toxemia sometimes months apart, while pulmonary abscess usually comes on promptly following an acute infection in a patient who was previously in good health. I have seen a few cases of tuberculous abscess form in which the patient had complained of acute illness for only a short time. The patient with tuberculosis as compared with the one suffering from pulmonary abscess or bronchiectasis is more liable to suffer from nerve irritability, and, as a rule, shows a greater degree of nutritional disturbance when the acute process comes on. Repeated attacks of bronchitis are common in bronchiectasis and in tuberculosis, but not in pulmonary abscess.

Nature of Processes. Pulmonary abscess is a disease caused by microörganisms which produce acute infections. These organisms are often found in the air passages, as is the case during epidemics of acute respiratory disease. When the abscess follows operation on the upper respiratory tract the bacteria are probably dislodged in large numbers and aspirated directly into the trachea and bronchi. They are capable of ready implantation and rapid multiplication. They follow the direction of the strongest air currents with greatest ease and usually produce their infection in the lower lobes.

Bronchiectasis, being a disease of the bronchi in which dilatation and distortion occur as a result of pathological changes in their walls, often follows fibrosis and contraction of pulmonary tissue. It is commonly found near the hilum, although the affection may involve the bronchi in all parts of the lung.

Pulmonary tuberculosis, being a chronic infection resulting from microörganisms which are not commonly found in the air passages of those who are not suffering from tuberculosis, and which require time for multiplication, is not a disease which results immediately on the bacteria gaining access to the air passages. If the patient has not been previously infected, the bacilli, after entering the tissues pass readily to and settle in the lymphatic glands and are later carried through the blood or lymph stream to be deposited in the capillaries or lymph spaces of the pulmonary tissue. This is the manner in which lung infection most probably takes place. While implantation of the microörganisms which produce the acute infec-

tions is favored by the relatively greater motion and greater force of the air currents in the lower lobes of the lung which force the bacteria deeper into the tissues, the relatively lessened motion of the apex favors implantation of the slowly developing blood and lymph-borne tubercle bacilli; consequently, active tuberculosis with cavity formation is usually first found near the apices while pulmonary abscess is usually found in the lower lobes, and bronchiectasis may be found in any portion, but often affecting the large bronchi near the hilum.

Inspection. On careful inspection a diminution of motion will nearly always be noted on the side of the involvement in all of these affections, because all reduce the elasticity of the lung tissue, cause a loss of tissue and produce a reflex diminution of motion through the diaphragm and other muscles of respiration. In pulmonary tuberculosis this may be difficult to ascertain in those instances in which there is a lesion in both lungs. In bronchiectasis the lung involved is practically always contracted and the mediastinum shifted toward that side. In pulmonary abscess, contraction with shifting of the mediastinum may or may not take place, although it usually does if the process is a chronic one. The same is true of tuberculosis.

Reflex Changes in Muscles and Other Soft Tissues Determined by Inspection and Palpation. The reflex spasm in the muscles and degeneration of the soft tissues—skin, subcutaneous tissue and muscles—is, as a rule, not as marked in pulmonary abscess and bronchiectasis as it is in pulmonary tuberculosis. The extent of the degeneration, when the process has become chronic, depends upon the extent and character of the previous inflammatory process. Pulmonary abscess is a focal infection in the lung. It may be single or multiple, but, as a rule, it appears as an acute disease in tissue which has not been, as is the case with tuberculosis, for a long time previously the seat of widespread foci of infection. Those abscesses which have followed our recent epidemics of acute respiratory infections, however, often occur near the base in the midst of areas of widespread fibrosis of pulmonary and pleural tissue. Bronchiectasis is, as a rule, limited in the amount of tissue involved. Like pulmonary abscess and unlike pulmonary tuberculosis it is rarely found in the midst of numerous active foci of infection. Pulmonary tuberculosis, on the other hand, when it becomes an active clinical process with cough, expectoration and cavity formation, is nearly always a chronic disease and the cavity is formed in tissue which, as a rule, is and usually has been, for a long time, the seat of many foci of infection which have been undergoing all degrees of active inflammation. The result is that pulmonary tuberculosis offers the greatest opportunity for reflexes. The muscles of the shoulder girdle and diaphragm are more tense (increased tension in the latter is inferred from the limited motion) during the activity of the tuberculous process than is found in the other diseases. When the

disease becomes chronic these muscles and the soft structures (skin and subcutaneous tissue) in the neck and down to the second rib anteriorly and the spine of the scapula posteriorly show far more reflex trophic changes in tuberculosis than in the other two diseases. In fact, chronic tuberculosis of the lung may be suspected whenever the neck muscles and the subcutaneous tissue and skin of the neck and chest above the second rib anteriorly and the spine of the scapula posteriorly are markedly degenerated. Pulmonary abscess and bronchiectasis also cause degeneration in these same tissues, but, as a rule, it is not so extensive, and I have seen instances of these affections which caused practically no reflex trophic changes.

Palpation and Percussion. Percussion may give little or much information in abscess and bronchiectasis, but is of far more importance in pulmonary tuberculosis. Palpation has been of more aid to me than percussion.

Auscultation. On auscultation the signs elicited in pulmonary tuberculosis with expectoration are usually more or less definite. If a cavity is present in active tuberculosis it is found in the midst of actively diseased tissue, which usually gives rise to characteristic respiratory sounds and many rales; if chronic, the tuberculous process outside the cavity may be partly or wholly healed, under which circumstances the signs elicited on auscultation may be similar to those of pulmonary abscess. The signs of pulmonary abscess and bronchiectasis, as determined on auscultation, are usually few and often very indefinite. In fact, the nature of the process may be suspected from this fact: a definite history of cough and expectoration, usually a fairly large quantity, sometimes even several ounces a day, and comparatively few signs of moisture on auscultation.

Explanation of Different Auscultatory Findings. If the examiner only can form a true conception of why there are marked changes on auscultation in pulmonary tuberculosis, and why even with larger quantities of sputum, as is often the case, there is such an absence of changes on auscultation, in pulmonary abscess and bronchiectasis, then the differentiation of these affections will be easier. This I shall attempt to show graphically by the accompanying illustrations.

The explanation of this fact is based upon the difference in pathology as mentioned above when considering the reflexes which arise from these processes.

Mucous rales or crepitations may or may not be elicited over cavities, depending on whether or not the mucus which they contain is disturbed by the ingress and egress of air. Ronchi are sometimes heard over them. Conditions which favor the production of the most constant and greatest quantity of pulmonary rales are not found in the cavity itself but in the surrounding tissue as noted in pulmonary tuberculosis.

The relative prominence of rales in these three affections may be illustrated by the accompanying figures:

Fig. 1 illustrates the conditions present in pulmonary tuberculosis. A large cavity *A* has formed near the apex. It will be noticed that this has taken place in an area which is the seat of a widespread

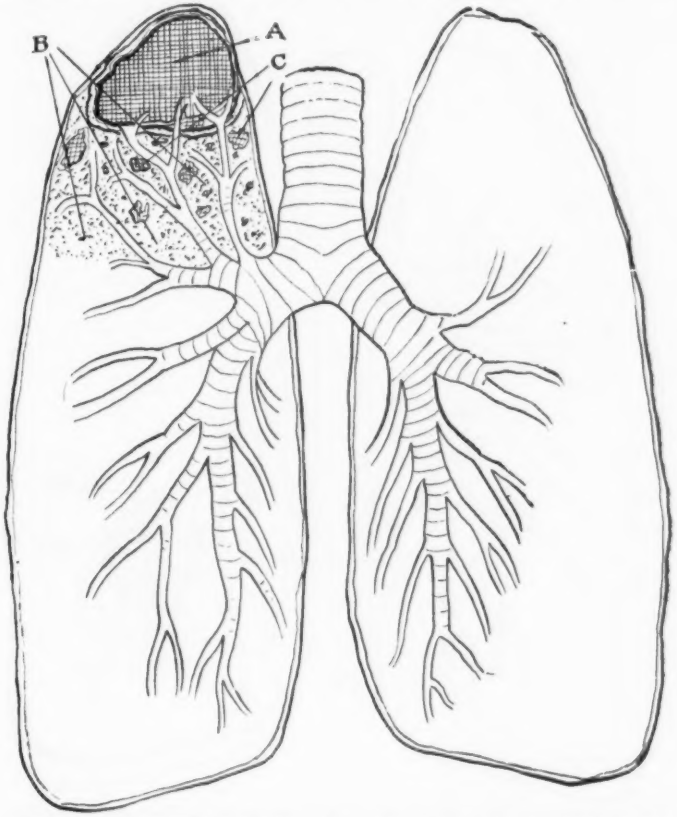


FIG. 1.—Diagrammatic illustration of a cavity due to pulmonary tuberculosis. The cavity, *A*, is surrounded by tissue which is the seat of tuberculous infiltration, *B*, and which contains many small cavities, *C*. These are ideal conditions for the production of rales.

tubercular involvement, as illustrated by the dotted area *B*, throughout which there are numerous small cavities *C*. Here we have the ideal conditions for the production of crepitations and mucous rales: inflammation with foci of necrosis involving the walls of air cells and bronchi accompanied by an increased production of mucus which must find its way toward the trachea through bronchi of all

sizes. The cavity itself is at times the seat of coarse rales, at other times no rales are elicited over it. Not infrequently I have seen the sudden disappearance of rales take place over an area of tuberculous infiltration as a result of cavity formation.

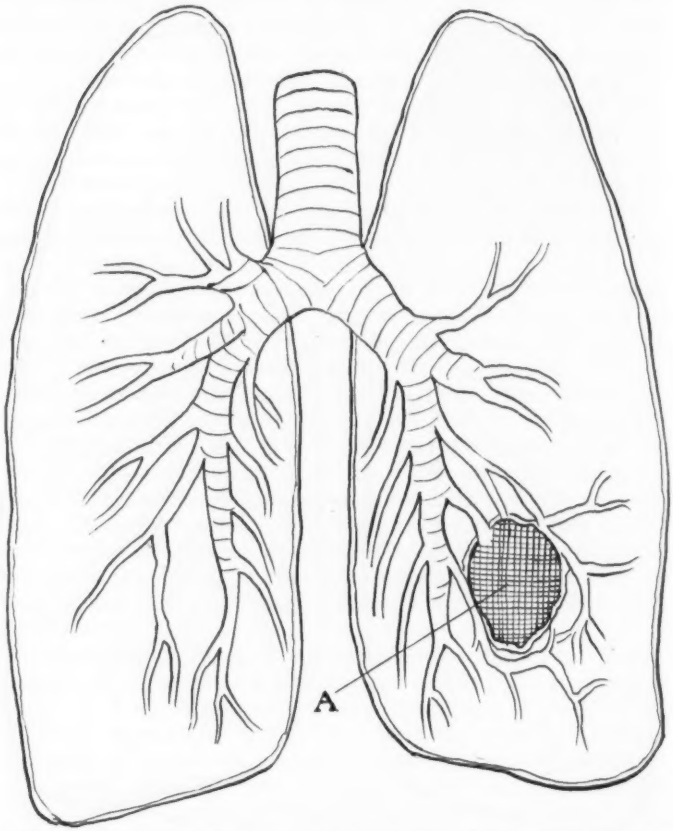


FIG. 2.—Diagrammatic illustration of acute pulmonary abscess. The abscess, *A*, is situated in the midst of and surrounded by healthy pulmonary tissue. The source of rales is the cavity itself and the bronchi leading from it. This condition is not favorable to the production of many rales.

Fig. 2 illustrates the condition present in pulmonary abscess. An abscess *A* has formed as a result of acute bacterial infection. As a rule the first pulmonary abscess which forms is an acute process coming on within a few days after the implantation of bacteria has occurred. The surrounding tissues may not be at all infected. This is particularly characteristic of those abscesses which follow opera-

tive procedure upon the upper respiratory tract. The abscess often forms in a single focus the same as a boil forms on the surface of the body. When the pressure in the abscess becomes sufficiently great, rupture occurs at the point of least resistance, which is usually into a bronchus.

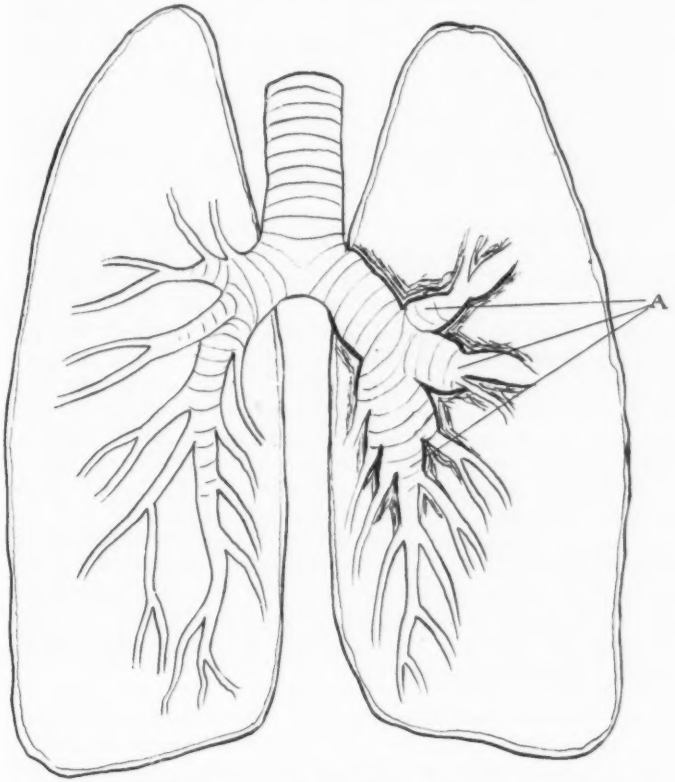


FIG. 3.—Diagrammatic illustration of bronchiectasis. The bronchiectatic dilatations *A* are surrounded by pulmonary tissue which is not the seat of infection, consequently the main source of rales is the mucus which forms in the dilated bronchi. This condition is not favorable to the production of many rales.

A pus-forming pocket remains which discharges through the bronchus. The conditions in the surrounding tissues which favor the production of crepitations and rales as shown in pulmonary tuberculosis in Fig 1 are absent and the chief source of whatever rales may be present is the abscess cavity itself and the bronchus or bronchi which drain it. The result is that crepitations and mucous rales are few in abscess produced by acute infections as compared

with the abscess cavities which accompany pulmonary tuberculosis, unless the latter have existed for a long time and the tuberculous involvement of the surrounding tissue has healed.

When multiple abscesses form in non-tuberculous lesions, as they sometimes do, particularly in those cases which become chronic, each one repeats the same cycle of events as noted in the acute single abscess. Varying amounts of scar tissue result, but still the widespread inflammatory and destructive processes which characterize tuberculosis and which favor so greatly the production of crepitations or mucous rales is absent. If the infectious process in either pulmonary tuberculosis or pulmonary abscess involves the pleura, then crepitations may be present which may be differentiated from pulmonary rales only with the greatest difficulty and sometimes not at all.

Much the same condition is found in bronchiectasis as far as the production of rales is concerned as has just been described in pulmonary abscess. The bronchi are dilated and their walls thickened, as shown at *A* in Fig. 3, in such a manner that the dilatations have much the same physical appearance as abscess cavities. The surrounding tissue is thickened, fibrous in nature and offers little opportunity for the production of crepitations and mucous rales. At times there is constriction of the bronchi proximal to the dilatation which may favor accumulation of secretion and cause sounds on auscultation; but there are rarely heard on auscultation, either in abscess or in bronchiectasis, sounds which will afford any idea at all of the extent or seriousness of the pathological process present.

A history of persistent expectoration of moderate or large quantities of sputum, with a diminished respiratory excursion on one side of the chest and an absence or paucity of crepitations or mucous rales on auscultation over the side affected, should make one think of pulmonary abscess or bronchiectasis. Ronchi are often present, but they too may be absent.

IMMINENT PSYCHOLOGY: A PROPHECY AND A PLEA.[1]

By Joseph Collins, M.D.,

PHYSICIAN TO THE NEUROLOGICAL INSTITUTE, NEW YORK.

After we have had an encounter that tests our capacity and our endurance we should submit ourselves to examination that we may know our actual and potential strength and worth. After a merchant or a banker has had unusual and testing demands made upon his

[1] Read before the Thirty-fourth Annual Meeting of the Association of American Physicians, held at Atlantic City, June 16, 1919.

stock or his capital, he deems it not only prudent but necessary to take an inventory.

The medical profession of this country has been called upon the past two years to give an account of its competency that tested it to a degree never imagined or anticipated. That it was not found wanting, spiritually or materially, is gratifying: that it was found inadequate in some respects is regrettable. It should be our desire and our duty to surmount the conditions upon which such inadequacy depended. It is meet that we should profit by our experience. We read and we hear it said by surgeons and physicians that we have not learned much from the war, meaning that no new principles in pathology, bacteriology or chemistry have been established or elucidated. But if the war has shown us that our training as physicians is imperfect, and, in some ways, inadequate, we have learned that which may profit mankind far more than the discovery of a new antiseptic or a new treatment of wounds.

I confine my remarks to the department of medicine with which I am identified, neurology, which, of course, I use to include disorder of the mind, emotions, personality, soul—call it what you will.

STATEMENT OF FACT. The medical profession was unprepared to make adequately, properly and expeditiously the examinations which would eliminate from the volunteer and drafted men, actual and potential disorder of the nervous system.

It was incompetent, in a measure, to examine, interpret and treat disorder of the nervous system flowing from war and its entailment.

It is not prepared now to do the work of reconstruction as well as the medical profession of some other countries.

The explanation of this dereliction is (1) the branch of medicine known as neurology has never been properly or adequately taught medical students in this country; (2) the branch of physiology known as psychology has been treated by medical pedagogues and practitioners with scorn and (3) alleged and admitted psychiatrists have not considered it essential to be physicians, diagnosticians, interpretists and therapists first and psychiatrists second.

The war revealed that next to injury and general medical diseases, disorder of the mind and nervous system was the most incapacitating disease of soldiers. It convinced the medical personnel of the army that training in neurology and psychiatry was essential if the average Medical Corps man was to do his work properly. The experience of neurological and psychological examiners at officers' training camps and at cantonments showed that large numbers of enlisted and volunteer men, officers and soldiers were of such intelligence that they were not fitted for officers or soldiers and that many actual and potential nervous and mental diseases were to be detected by careful examination. Out of one million seven hundred thousand men examined by psychological tests, approximately forty-seven thousand were found to be the

mental age of ten. From 3 to 5 per cent. of the men in officers' training camps were found to be afflicted with some form of nervous or mental disease that either incapacitated them or would incapacitate them under stress.

The importance of neurology in medical practice in the war is convincingly illustrated by the experience of France and England. For three generations France has had neurological schools through which large numbers of its physicians passed and in which they learned the fundamental principles of neurology and became familiar with cardinal methods of examination. As the result of this the medical profession in France was so enlightened that they were able to provide two important regulations in the matter of shell shock: (1) that victims of that so-called neurosis were not pensionable, and (2) that its occurrence was not an adequate cause for discharge from military service. This enlightenment of the medical profession of France saved many thousands of soldiers and millions of francs for that country. On the other hand, neurology in England has never had extensive recognition by the general practitioner. As the result, she has some twenty-five thousand men who are pensioned, invalid soldiers, most of whom were recoverable if they had been properly diagnosed and treated.

THE PROPHECY. We are now on the threshold of an era in which psychology is going to be applied to the problems of mundane life: work, occupation, recreation; the spiritual, physical, social, financial, hygienic betterment of mankind, including ourselves.

Within a generation admission to high schools, colleges and universities will be obtained, in great measure, by passing a psychological examination. It will be obtained by determination of the candidate's intelligence and his emotional reactions, and not by determination of how much Latin or Greek, algebra or history, he has been able to memorize.

Within the same period anyone seeking a position of responsibility or that requires for its satisfactory performance intelligence will be required to pass a pyschological examination, and upon that examination will depend largely the fate of the individual.

The choice of profession, occupation or career will be determined largely by psychological examination of the individual. In this way misfits will be prevented. Men and women adapted to the church will not go into medicine; those adapted to the stage will not go into finance; potential statesmen will not strive to be scientists.

Fitness for taking on work that requires for its successful accomplishment attention, energy, vision, imagination and any constructive mental quality will be determined by psychological and physical examination. Civil service examinations will no longer consist of geography, history, algebra and similar subjects; entrance to the diplomatic service will not depend upon knowledge obtained from

books; promotion or advancement in any intellectual field will not be dependent upon feats of memory. They will be determined by psychological examination of the individual seeking position and preferment.

The next great move that pedagogy will make will be in the field of psychology. There will be a radical change in the present method of grading schools. The grading of pupils will soon be done by determining the constitution of the pupil's mind, its potentialities, the trend and capacity of its contents. Children who have aptitudes, special qualities of mind or emotion will be grouped, while others lacking these but possessed of equally meritorious mental and emotional qualities of a different kind will be classed in another group, and they will be subject to different kinds of instruction.

Vast sums of money will be saved taxpayers and great numbers of individuals will be saved lives of incompetency and ignominy by the utilization of the facts that have today been established by psychology. Potential psychoneurotics will be recognized before deforming and incapacitating nervous and mental symptoms appear; the feeble- and tender-minded will be detected at a time when developmental measures may be applied with hope of success; and those from which are recruited cranks and criminals, prostitutes and wastrels, drunkards and hoboes will be recognized to be the legitimate care of the State and of the individual, whose combined effort must be to assist them to approximate normality before they have, by accident or design offended law or convention.

Many chronic diseases and much semi-invalidism which cannot be specifically designated depend upon disorder of internal secretions—that is, upon disturbed functions of glands controlled and regulated by the nervous systems and which develop and operate in connection with the emotions.

Health, resistance to disease, mental and emotional endowment, the things that make life worth living, are as intimately bound up with the origin and development of the sympathetic nervous system, and this in turn with instincts and emotions, as man is bound up with original sin. The physician who seeks to interpret them and prevent them thrusts a great handicap upon himself by ignoring these facts, and he who devotes his life to ameliorating or attempting to cure disease handicaps himself tremendously by not hearkening to the revelations of the science of psychology.

Medicine is about to be quickened, revived and enriched by doing teamwork with the science of psychology. Though the prevention of disease is, and must always be, the goal for which its votaries strive, the amelioration and cure of disease will continue to engross the vast majority of them. Psychology will, however, be utilizable in both fields. Already the man of affairs, the man of big business, is utilizing it by means of a new type of efficiency expert, the social and psychological engineer.

Preventive medicine must concern itself with the individual as well as with the germ. Resistance to disease may be partly a question of chemistry, but it is largely a question of emotions and psychophysical elaborations whose potency may be determined, and their existence influenced, by the physician versed in psychology.

To dwell upon the effect of mind upon matter before this audience, or to dilate upon the influence of mind upon disease in a country in which supernaturalism thrives so luxuriously as it does in this country, would be absurd. We physicians are about to be compelled to use forces scientifically which innumerable "ists" have used, and are using with success, empirically.

THE PLEA. The members of this Association are the medical teachers of the country, or the material from which the dominating medical teachers are recruited. It is to them that the rank and file of the profession, and the laity conscious of hygienic and social awareness, look for inspiration, guidance, initiative and accomplishment. They are the tone that makes the Esculapian music.

I appeal to you, therefore, to treat neurology as a legitimate child, worthy not only of parental affection and understanding, but entailing the obligation of development and maintenance, of fullest and most intimate admission to the family medical circle.

It would be no more absurd to maintain that a physician could be competent who was ignorant of physiology than it would to claim that one could be a competent neurologist who had not a comprehension of psychology. Psychology should be hailed with the warmth that chemistry was a generation ago. It gives promise of results equal to or surpassing those obtained by the physiological chemist.

Psychology should be taught medical students or a comprehensive familiarity with its fundamental principles should be demanded of those who knock at the portals of medicine as a career. Psychiatry should be taught in medical schools as physiological pathology and as a division of internal medicine—one of the most important divisions. The psychiatrist should be a thoroughly trained physician who has a bias toward or flair for psychology. The training in medicine should give him perspective; the training in psychology, penetration; and both should give judgment of fundamentals, which in physicians is often spoken of as insight, perspicacity, awareness—qualities essential to the real physician.

The successful physician of the future must make a biological study of human nature and of instinct if he would fulfil his privileges and discharge his duties. In no other way can he compete with the empiricists, supernaturalists and neoplatonists who have reaped such harvest in this country at the expense of the victims of incapacitating disorder of one or more of the bodily functions masquerading as disease of the nervous system.

To give such training there must be hospitals and laboratories

as well as teachers. The unstudied, uninterpreted material in general hospitals and the casual, transitory material of the dispensary is neither appropriate nor adequate. We must have hospitals for the study and interpretation of nervous diseases in connection with every school in which medicine is properly taught.

The career of the Neurological Institute of New York is an earnest of the need of such hospitals, and the service it rendered this country in giving rapid, intensive training to upward of three hundred physicians which would endow them with a measure of the capacity to handle the neuropsychiatric problems presented by the war is the reward of its founders.

The present proud position of the science of medicine is attributable to one factor—the laboratory. The elimination of disease by preventive measures has, in a measure, been accomplished by it and will continue to be accomplished by it. No less than twenty-five diseases are diagnosed with certainty by laboratory methods and the recognition of at least a score of others is assisted and facilitated by it.

Laboratory methods receive greater emphasis in medical education than any others. The psychological laboratory only is neglected and yet the technicians of the psychological laboratory made one of the important contributions of medicine in the Great War by the formulation of methods of mental and emotional measurement which permitted elimination of men unfit to contribute to military success while facilitating proper placement of officers and soldiers.

We cannot hope, nor would it be desirable, to make physicians into psychological laboratory technicians. The latter must be the assistant to the physician, just as the bacteriologist, the chemist and the photographer is. He must be the expert coöperating with the physician. They must do teamwork. They cannot do it if the physician balks, and instead of pulling, expends his strength in scorning the psychologist. The physician must be the judge of the psychologist's work—he must test it and he must know how to utilize it for the benefit of the sick.

It is not sufficient that the leaders of medical thought and the makers of the pace of medical efficiency shall say that they are ready and willing that the psychologist shall show them what he can do. They must do with the principles and formulation that he furnishes that which they did with those discovered and formulated by Pasteur.

Neurology and psychiatry must be properly taught in this country if American medicine is to get and maintain the place which it deserves. To accomplish this three things are necessary: (1) teachers; (2) hospitals; (3) the sympathetic atmosphere. The last is vital. I appeal to this organization to furnish it.

BRONCHIECTASIS: ITS DIFFERENTIATION FROM PULMONARY TUBERCULOSIS.

By B. Stivelman, M.D.,

MEDICAL SUPERINTENDENT, MONTEFIORE HOME COUNTRY SANATORIUM, BEDFORD HILLS, N. Y.

(From the Tuberculosis Pavilion of Montefiore Home and Hospital, New York City, and Montefiore Home Country Sanatorium, Bedford Hills, N. Y.

The importance of detecting pulmonary tuberculosis in its early stages has frequently and justly been dwelt upon, but many patients exhibiting symptoms and signs suggestive of advanced disease of the lungs have often been denied a careful investigation of the nature of their affection. The multifarious lung lesions produced by the tubercle bacillus and the extreme variation in the clinical course of any given group of cases have often influenced us to attribute signs, in the lungs deviating from the normal, to phthisis pulmonalis, the common disease, when in reality such signs, when carefully analyzed, after the history of the case is accurately ascertained, are found to be due to pathological changes, non-tuberculous in character.

In view of the growing tendency to isolate the "advanced consumptive," such cases have frequently been banished to hospitals for the tuberculous or to distant climatic health resorts, at great expense and inconvenience, branded with the stigma of tuberculosis before the nature of the disease in their lungs had been definitely determined.

To obviate such occurrences, many authors have, in recent years, emphasized various chronic lung affections simulating pulmonary tuberculosis. Some observers call attention to chronic non-tuberculous lung infections involving the lower lobe of either or both lungs; others describe conditions affecting the upper lobe. Syphilis of the lung is mentioned as a possible but rare source of error, and it has also been shown that chronic bronchitis and heart conditions at times give rise to moisture on auscultation, diminished resonance on percussion and subjective symptoms, such as cough, expectoration, etc. Yet surprisingly little has been said of bronchiectasis, although this disease resembles certain types of pulmonary tuberculosis most closely.

Bronchiectasis, it is true, will rarely if ever be confused with acute progressive phthisis, which runs a rapidly wasting course, with chills, fever, sweats, emaciation, etc.; but it will, with difficulty, be differentiated from that form of tuberculosis characterized by mild constitutional symptoms, little or no wasting, with physical signs suggestive of marked fibrosis. Indeed, the resemblance of bronchiectasis to such cases of phthisis pulmonalis is so great that

unless careful observation is afforded for a considerable length of time, and all modern diagnostic methods are applied, a differential diagnosis may be impossible. The cases of bronchiectasis which form the basis of this communication are a few of those sent to us as "advanced consumptives," and are reported in these columns with the intention of demonstrating the salient points that help us in the differential diagnosis.

Among the more difficult to diagnosticate are those cases in which careful thermometry reveals an elevation of temperature in the afternoon hours. The fever, together with the cough, expectoration and blood-streaked sputum, are frequently considered to be due to tuberculosis. It must be pointed out, however, that afternoon temperature is not uncommon in the older bronchiectatics and in those who, enfeebled for various reasons, do not efficiently expel their bronchial contents. In order to arrive at a definite diagnosis in such cases a painstaking analysis of the clinical history and repeated physical and sputum examinations are essential. The history will most usually disclose absence of early constitutional symptoms of toxemia and fair health in spite of distressing cough and profuse expectoration; the physical examination will reveal a unilateral lesion, most frequently involving one of the lower lobes. Repeated examination of the sputum will not show the presence of tubercle bacilli. The following case illustrates these points very clearly:

CASE I.—*Late bronchiectasis, with mild constitutional symptoms, due to retention of secretion, with autopsy findings.*

S. B., aged fifty-six years, housewife, admitted October, 1916. She had measles and cholera in infancy, pneumonia at six years of age and again three years before admission. She had frequent attacks of "la grippe" since her last illness.

Present Illness. Since the pneumonia, three years ago, the patient has been subject to frequent colds, with more or less constant cough, which gradually became more and more distressing. Expectoration, at first scanty, became profuse and pain was soon complained of in the lower part of the right chest posteriorly. For the last fourteen months her sputum has at times been blood-streaked; she lost twenty pounds in weight and has been suffering from marked shortness of breath. On physical examination we found a fairly well-nourished individual; the cheeks, lips and finger-tips were slightly cyanosed; the fingers were clubbed and the nails markedly curved. The right chest was somewhat retracted in the supra- and infraclavicular spaces; slight atrophy of the muscles of the right supraspinous fossa was also noticed. Physical exploration of the chest showed very markedly impaired resonance throughout the entire right chest, the note being flat in the region of the lower lobe. Breath sounds were bronchial over the upper half of the right chest, both anteriorly and posteriorly, and cavernous

over the middle lobe. Throughout the right lung large, moist, consonating rales were heard and whispered pectoriloquy was elicited over the middle lobe. The left chest was emphysematous.

While at the hospital her cough increased in severity, expectoration averaging 450 c.c. in twenty-four hours; it was fetid and separated into three distinct layers on standing. Her temperature frequently rose to 101° in the afternoon, but the pulse was only slightly accelerated. On numerous examinations of the sputum tubercle bacilli could not be found. The urine was negative. The Wassermann reaction of the blood was negative; blood-pressure was 118 systolic and 86 diastolic.

FIG. 1.—Patient B. S. Left lung: Marked hilus changes; otherwise negative. Right lung: Diffuse infiltration throughout the lung most marked at the middle lobe with evidence of a great many dilated bronchi. Heart moderately enlarged and slightly pulled to right. Arch of aorta moderately dilated. Evidence of pleuropericardial adhesions.

Roentgen-ray examination (Fig. 1) disclosed marked hilus changes in the left lung; otherwise negative. Right lung: diffuse shadow throughout the entire lung, most marked at the middle lobe, with evidence of a great many dilated bronchi. Heart was moderately enlarged and slightly pulled to the right. The arch of the aorta was moderately dilated. Right diaphragm elevated and evidence of pleuropericardial adhesions was noted. Interlobar fissure was thickened.

Because of the history of pneumonia immediately preceding the present complaint the absence of fever in the early stage of the

disease, comparatively slow pulse, the profuse and periodically fetid expectoration, fair nutrition, with a history of cough of three years' duration, the negative findings in the profuse expectoration and the absolute unilateral involvement more marked at the lower lobes, a diagnosis of bronchiectasis was made and the patient was transferred to a non-tuberculous ward of the hospital. Here she grew progressively weaker, began to show signs of right heart insufficiency and died eight months after admission.

FIG. 2.—Patient B. S. Note the various-sized cavities throughout the lung. One large cavity communicates with a bronchus (split open) at the middle lobe.

Postmortem examination revealed the following condition: A few pleural adhesions in the left lung; otherwise negative. The right pleura was markedly thickened, and very firm and thick adhesions caused the lung to be separated with great difficulty from the chest wall. The right lung (Fig. 2) weighed almost three times as much as the left and was firm and hard in consistency.

The whole lung appeared to be studded with cavities, the walls of which were smooth and glistening. They had no fixed capsule and invariably communicated with bronchi. On slitting the bronchi it was evident that these cavities were true bronchial dilatations. Active tuberculous lesions could neither be found macroscopically nor microscopically.

Bronchiectasis Complicated by Pleural Effusion. Pleural effusion is one of the most frequent complications of pulmonary tuberculosis. Indeed, in doubtful apical lesions the occurrence of an effusion frequently clinches the diagnosis of tuberculosis, whether or not tubercle bacilli are found in fluid aspirated either microscopically or by animal inoculation. But an effusion superimposed on a pulmonary lesion in the lower lobes is not necessarily tuberculous. Carcinoma of the lungs and at times bronchiectasis may be complicated by such effusions. The diagnosis in such cases is not impossible when it is remembered that tubercle bacilli are invariably present in the abundant sputum of the far-advanced tuberculous in whom physical findings reveal marked activity of the process. In the bronchiectatic the abundant fetid sputum is free from tubercle bacilli.

Furthermore, it is exceedingly rare to find a unilateral far-advanced tuberculous lesion, while bronchiectasis is most frequently unilateral and almost always involves the lower lobes. Pulmonary osteo-arthropathy is most marked in bronchiectasis and the general health of these patients suffers but little in spite of the distressing cough and profuse expectoration of many years' duration. The following case illustrates the points discussed most distinctly:

Case II.—M. K., aged forty-seven years, real estate broker, admitted October, 1916.

Family and previous personal history have no bearing upon his present trouble. For the past twelve years he has been coughing and expectorating, but never had constitutional symptoms, such as chills, fever, sweats, nor did he have hemoptysis. He did not lose weight. Four years ago he became acutely ill with pneumonia and pleurisy. He was in bed for two weeks and then improved rapidly. The cough, however, did not lessen in severity, but was even worse after convalescence. Eight months after his pneumonia his sputum became fetid in character and quite abundant; it was expelled in paroxysms and in large quantities. He had a few slight attacks of hemoptysis and noticed that when the amount of sputum diminished fever made its appearance, especially toward evening. He lost considerable weight and strength. His chief complaint has been dyspnea.

On physical examination the patient was found to be markedly cyanosed. His drumstick fingers were cyanotic and his breathing was very hurried. The right supraclavicular fossa was markedly

depressed. On percussion the right chest was dull throughout, with the exception of the base where the note was flat. Broncho-vesicular breathing and a few crackles were elicited over the right apex; cavernous breathing and whispered pectoriloquy and many moist gurgling rales were heard from the second rib down, excepting over the area of flatness, where neither breath sounds nor adventitious sounds were audible. Left chest was apparently normal. Pleural effusion was diagnosticated and fluid aspirated from the right pleural cavity and injected into a guinea-pig, which did not develop tuberculosis in eight weeks.

During his stay at the hospital his sputum averaged over 500 c.c. in twenty-four hours, constantly negative for tubercle bacilli. His urine was negative. He died with symptoms of broncho-pneumonia two weeks after admission.

This patient gave a typical history of bronchiectasis following a pneumonic process engrafted upon chronic bronchitis. The many negative sputa and guinea-pig inoculations, the profuse and fetid expectoration, strictly unilateral involvement, the fair state of nutrition in spite of the long duration of infection, the absence of early constitutional symptoms, all pointed toward bronchiectasis as being the condition existing.

Roentgen-ray examination was of little assistance in this case, since it showed a homogeneous shadow throughout the right lung, denser at the base. It is true that in the later months the affection in this case may have been easily mistaken for pulmonary tuberculosis, complicated by pleurisy with effusion, an effusion into the pleural cavity in cases of bronchiectasis, however, is by no means infrequent.

Bronchiectasis with Profuse Recurrent Hemoptysis. Hemoptysis is the most discouraging single symptom of pulmonary tuberculosis. It is also at times the first and only symptom of phthisis. Indeed, it is frequently alluded to as the pathognomonic symptom of this affection. But those who treat many pulmonary patients have seen fatal cases of hemoptyses of non-tuberculous origin, many of which were confirmed by anatomical investigation. Hemoptysis occurs almost as frequently in bronchiectasis as in pulmonary tuberculosis. The concomitant marked pulmonary osteo-arthropathy, the lack of constitutional symptoms in the early period of the disease, the negative findings in the sputa, the exclusive unilateral and lower lobe involvement, clear apices on roentgen-ray examination, the comfortable and active mode of life in spite of the long duration of the disease, will point toward bronchiectasis as being the condition existing. The following case illustrates the points above mentioned most vividly:

Case III.—A. A., aged twenty-one years, male, admitted February, 1914. Father and one brother are suffering from chronic recurrent hemoptyses, cough and expectoration. He had pneu-

monia at nine months and again at fifteen months of age. Since the second attack of pneumonia the patient has been coughing more or less constantly, more severely during the spring and fall, but growth was not retarded and his health was generally fair until he reached the age of ten years, when during a fit of coughing he noticed blood in his sputum. He therefore dates his present illness since that time. His main complaints at the time of admission are copious hemorrhages, frequently and regularly recurrent, cough and expectoration more marked in the spring and fall. He appears well nourished. His temperature, pulse and respiration are invariably normal. On admission the only physical signs elicited in the chest were dulness, with diminished respiratory murmur over both bases.

FIG. 3.—Patient A. A. Note clear apices. Marked hilus changes radiating into both lower lobes; more marked on right. Evidence of shrinking process affecting left lung; most marked at the lower lobe. Heart enlarged and probably pulled to left.

While at the hospital the hemorrhages continued. His fingers became markedly clubbed, cough and expectoration appearing at irregular intervals, but his general condition remained unaltered, his weight stationary and repeated sputum examinations proved negative for tubercle bacilli. The urine was negative; the Wassermann reaction was negative.

Roentgen-ray plate showed clear apices, marked hilus changes radiating into both lower lobes, more marked on the right. Evi-

dence of shrinking process affecting the left lung most marked at the lower lobe. Heart enlarged and pulled to the left.

During October, 1916, large moist rales were found at the left base following a hemorrhage. At this time, in view of his clubbed fingers, profuse and at times fetid expectoration, large moist rales, impaired resonance and feeble breath sounds in the left base, the fact that his body was well preserved, the negative examination of his sputa, the negative Wassermann reaction, the absence of ray fungus in the sputum and the absence of definite constitutional symptoms, a diagnosis of bronchiectasis was ventured.

In February, 1917, a bronchoscopy was performed by Dr. Sidney Yankauer, who gave the following report: "Right bronchus is normal; left bronchus is longer and broader. An abundance of pus seems to come only from the left lower lobe, the bronchus of which is filled with thick mucopus. After the removal of the pus, dense tissue closes the bronchus, which probably was granulation tissue."

The sputum at the present time averages 100 c.c. in twenty-four hours, has a somewhat sweetish odor and is still free from tubercle bacilli. Profuse hemorrhages recur regularly and there is a marked freedom from constitutional symptoms.

The latest roentgenogram (Fig. 3) shows marked hilus changes radiating into both lower lobes, with evidence of a shrinking process in the left lower lobe. The apices apparently normal.

Bronchiectasis Involving Upper as Well as Lower Lobe. Signs of excavation elicited over an upper lobe are almost invariably due to pulmonary tuberculosis. Pulmonary abscess is at times encountered, but is very rare indeed and can be diagnosticated with little difficulty. Upper lobe bronchiectasis is exceedingly rare and a differential diagnosis from phthisis pulmonalis requires a careful study and a long period of observation. The abundant and at times fetid sputum free from tubercle bacilli, the long duration of the disease without interfering with the working capacity of the patient and the absolute unilateral involvement, the absence of constitutional symptoms of toxemia and the marked osteo-arthropathy all speak in favor of bronchiectasis. Guinea-pig inoculation of the sputum in question is of great value while roentgenological examination may help but little. The following case illustrates the points above discussed:

Case IV.—L. C., aged thirty-seven years, tailor, admitted January, 1915.

Family and previous personal history unimportant.

Present Illness. Began with cough and expectoration following pneumonia at the age of ten years, but in spite of this he worked until two years before admission to this institution, when he was suddenly taken ill with chills, fever, cough and expectoration, which lasted about one week. The condition was diagnosticated as phthisis at a sanatorium for the tuberculous.

Physical examination on admission showed a well-nourished man, dusky in appearance, suffused expression, nose bulbous, eyelids puffy, markedly clubbed fingers, cyanosed nails and marked evidence of pulmonary osteo-arthropathy. The pulse was 75 per minute. The left chest was somewhat retracted, especially at the base, lagged on respiration and showed very limited expansion on deep inspiration. Supra- and infraclavicular fossæ were retracted on both sides, more so on the left. The entire left chest was markedly dull on percussion and resonance at the right apex was slightly impaired. Cavernous breathing and many moist rales were heard over the upper lobe on the left side, and feeble breathing, with few crepitant rales, over the lower lobe. Whispered pectoriloquy was very marked over the left upper lobe. Few scattered dry rales were discerned on the right side over the third and fourth interspace near the sternum.

While at the hospital the patient never showed any evidences or constitutional symptoms of toxemia. His pulse was never above 85; his weight was stationary; his cough moderate, but his expectoration averaged 475 c.c. in twenty-four hours, separating into three layers on standing, now and then foul-smelling. No tubercle bacilli could be found on forty-five examinations, many of which were made with antiformin; but streptobacilli, Streptococcus hemolyticus and Micrococcus catarrhalis were found. A guinea-pig injected with 10 c.c. of the sputum, and killed eight weeks later, showed no evidence of tuberculosis.

We may interpolate that, curiously, the tuberculosis complement-fixation in this case was 2 plus; blood-pressure 117 systolic and 75 diastolic; urine showed evidence suggestive of chronic parenchymatous nephritis. The Wassermann was repeatedly negative. He received ten injections of autogenous vaccine without any noticeable improvement. The patient finally left the hospital to seek employment.

Roentgen-ray plate showed a homogeneous shadow occupying the entire left chest, with suggestion of extensive vomica formation at the second interspace anteriorly, mediastinal organs markedly pulled to the left. The right lung was apparently clear.

This case was diagnosticated as bronchiectasis because of the following: Good nutrition, although coughing for twenty-seven years, marked pulmonary osteo-arthropathy, absence of constitutional symptoms of toxemia, such as afternoon fever, sweats and tachycardia, profuse and fetid expectoration, negative sputum on examination and guinea-pig inoculation, and absolute unilateral involvement, as disclosed on physical and roentgenological examination. It is true that on superficial examination the physical signs were strongly suggestive of pulmonary tuberculosis, but bronchiectasis may involve upper lobes as well as lower lobes, while unilateral lesions in old cases of tuberculosis are extremely rare. In this

case it is most probable that the pathological changes in the lung involved were primarily due to thickened pleuræ following pneumonic processes, causing at first pulmonary fibrosis and ultimately bronchial dilatation.

Bronchiectasis Complicated by Endomyocarditis. In sanatoriums for the early tuberculous, especially those who have a large proportion of "sputum negative" cases, it is not uncommon to find cardiac cases, usually mitral disease, who have erroneously been sent there for treatment. These usually give a history of blood-streaked sputum, loss of weight, cough and perhaps slight afternoon temperature. When the signs in the lungs suggest the existence of an extensive lesion these are considered to be due to tuberculosis, the patient placed in the category of the "few cardiacs with tuberculosis," in spite of the negative findings in the sputum and absolute unilateral involvement.

Bronchiectasis and organic cardiac disease frequently coexist, and under the circumstances a diagnosis should be easily arrived at.

The following case will bring out these points.

Case V.—R. G., janitress, aged thirty-five years, married, admitted October, 1917.

Family History. Negative. She had rheumatism at fourteen.

Present Trouble. Began about ten years ago, with cough and expectoration following pneumonia. These symptoms, while mild at first, gradually increased in severity, so that cough is now distressing and expectoration has been profuse for the past three years, and at the present time averages about 300 c.c. in twenty-four hours. There is no history of hemoptysis, chills, fever, sweats or loss of weight, although there is marked dyspnea on exertion. She gave birth to four children since the onset of the disease and apparently childbirth did not materially affect her.

On examination the patient seemed to be well nourished, but had clubbed fingers, respiration hurried, her lips, cheeks and fingernails were cyanosed, marked scoliokyphosis to the right; diminished resonance throughout the right lung and marked amphoric breathing and whispered pectoriloquy over the right middle lobe, harsh breathing and increased transmission of voice sounds over both bases. Numerous large, moist, consonating rales were very audible over both lower lobes. The heart was enlarged to left and right, and a loud systolic murmur at the apex transmitted to the left axilla and a systolic blow at the aortic area were clearly audible.

While at the hospital the temperature and pulse remained fairly normal, but the cough and expectoration were distressing, sputum averaging 300 c.c. in twenty-four hours. Repeated examinations of the sputum did not disclose the presence of tubercle bacilli. Roentgenogram showed advanced fibrosis involving practically the whole right lung, more marked at the base.

In view of the long duration of her illness, the fact that four preg-

nancies did not aggravate her condition, the absolute unilateral involvement, most marked at the lower lobe, and the negative findings in the sputum, a diagnosis of bronchiectasis was made. The organic cardiac condition and the absence of all symptoms of toxemia in spite of the profuse expectoration and distressing cough practically rules out phthisis pulmonalis.

Bronchiectasis in Young Adults. In ordinary sanatorium practice one is particularly impressed with a group of cases which could be classed among the "fat tuberculous," but present a clinical history and physical signs entirely incompatible with pulmonary tuberculosis. These patients are between the ages of fourteen and sixteen years, give a history of cough and expectoration of many years' duration following a pneumonia or pleurisy. They are usually well nourished, in fact somewhat overweight, active and happy. They deny such constitutional symptoms of toxemia as chills, fever, sweats and tachycardia, which are most marked in the tuberculous of this age. They present a suffused expression, puffy eyelids, bulbous nose and markedly clubbed fingers, and physical examination discloses an extensive involvement of one of the lower lobes, with evidence of sacculation and cavity formation and a great deal of moisture. Their sputum is fetid and abundant, brought up in mouthfuls periodically, and is free from tubercle bacilli.

A differential diagnosis in such cases is not difficult if we bear in mind that the young tuberculous, with involvement of the lower lobes, are hectic, emaciated and soon moribund, and tubercle bacilli are invariably present in their profuse expectoration. In such cases both upper lobes are also extensively involved and a definite history of toxemia is invariably given. On the other hand, patients suffering from bronchiectasis are well nourished, comfortable, active, give no history of toxemia, show no evidence of upper lobe involvement, their extensive lesion is at either lower lobe but almost always unilateral and their profuse expectoration is free from tubercle bacilli. Roentgenographic examination, although it will not show more than indefinite shadows at the site of the lesion, will almost invariably disclose clear apices. Bronchiectasis in these cases is the end-result of chronic shrinking processes, due to thickened pleuræ of non-tuberculous origin or interstitial pneumonia. The following four cases are a few of the many cases under our observation, which illustrate the points discussed above:

Case VI.—S. M., female, aged fourteen years, admitted March, 1915.

She had diphtheria at three years and lobar pneumonia in the left lung at eleven years, which did not end by crisis.

Present Illness. Began with pneumonia three years ago, which was followed by persistent cough and expectoration and gradual development of dyspnea on exertion. She did not have

such constitutional symptoms as recurrent chills, fever and sweat, gained in weight normally, but noticed blood-streaked sputum at times, and was aware of the fact that her fingers became clubbed.

On physical examination we found a well-nourished young girl, cheeks, lips and nails slighty cyanosed, fingers markedly clubbed. Left chest lagged on respiration and there was marked retraction in the supra- and infraclavicular spaces. A dull percussion note was elicited on the left chest from the third space to the base anteriorly, and from the inferior angle of the scapula to the base posteriorly the note was very dull. The left apex, however, was apparently clear. Over the dull area large moist consonating rales could be heard both anteriorly and posteriorly, and bronchial breathing and whispered pectoriloquy could be discerned from the angle of the scapula to the base. The heart was pulled somewhat to the left. The right apex showed mild impairment of resonance and harsh breathing. A roentgenogram disclosed increased density of both roots, radiating into both lower lobes, more marked on the left side.

While at the institution the patient had recurrent attacks of slight hemoptysis; the pulse and temperature, however, were about normal; blood-pressure was 95 systolic and 65 diastolic. Urine and Wassermann reactions were negative. Weight remained stationary. Sputum was profuse and at times fetid, and numerous examinations for tubercle bacilli were negative.

In view of the extensive unilateral lower lobe involvement the absence of constitutional symptoms, such as chills, fever, sweats and tachycardia, good nutrition and fair health, in spite of the persistent cough and expectoration, the negative Wassermann reaction, the negative results on examination of the sputum, a diagnosis of bronchiectasis was made.

Case VII.—F. B., aged fifteen years, admitted September, 1918. The patient had pleurisy and pneumonia in infancy.

On admission, complained of cough and expectoration of many years' duration. About six months prior to admission the patient realized that her cough had gradually become more distressing and expectoration more abundant and at times fetid and that her fingers were markedly clubbed. Pain in the left chest was also complained of. No history of constitutional symptoms of toxemia could be obtained.

On examination we found a well-nourished, robust young girl, slightly cyanosed, with bulbous nose, suffused expression and puffy eyelids. Her fingers were markedly clubbed. Left chest lagged on respiration and distinct signs of sacculation or cavity formation, with numerous large moist rales, were elicited over the left lower lobe anteriorly and posteriorly. Her heart was pulled to the left. Right lung was negative.

While at the hospital the patient had numerous slight attacks

of hemoptysis; cough was distressing. Sputum averaged 180 c.c. in twenty-four hours and was at times fetid. Her temperature, pulse and respiration remained normal. The sputum was free from tubercle bacilli. The urine was negative. Von Pirquet was slightly positive on two occasions and tuberculosis complement-fixation was 2 plus. Roentgenological examination (Fig. 4) revealed dense shadow in the region of the left lower lobe, with heart pulled to the left, but the apices were clear.

FIG. 4.—Case F. B. Note clear apices. Marked bilateral hilus changes. Dense homogeneous shadows at left lower lobe. Heart pulled to left.

On account of the unilateral lower lobe involvement, clear apices on physical and roentgenological examinations, the negative findings in the sputum, the excellent health in spite of distressing cough and expectoration of long duration and the absence of constitutional symptoms of toxemia, a diagnosis of bronchiectasis, possibly due to thickened pleura, was arrived at.

CASE VIII.—J. L., aged seventeen years, schoolboy, admitted September, 1918.

Family and previous personal history unimportant.

Present Trouble. Began five years ago with moderate cough and expectoration, which greatly increased in severity, so that the cough is now distressing and the sputum profuse, extremely fetid, frequently blood-streaked and brought up in paroxysms of distressing cough, usually early in the morning, influenced by posture. He gained normally in weight, going hand in hand with his growth in

height, and is vigorous and healthy otherwise. He does not remember ever having had constitutional symptoms such as chills, fever, sweats and tachycardia.

On examination we found a very well-nourished young adult, nose markedly bulbous, eyelids puffy, lips, cheeks and nails markedly cyanosed and fingers exquisitely clubbed. Respiratory excursions were markedly diminished throughout the left chest and a dull note on percussion was elicited over both lower lobes, more extensive and marked on the left side. The auscultatory signs suggested the presence of extensive excavation or sacculation over the left lower lobe, and increased whispered voice and many large moist conso-

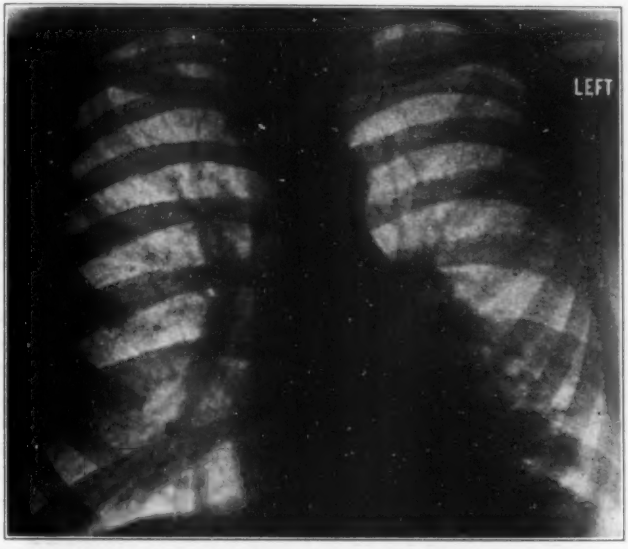


FIG. 5.—Patient J. L. Note clear apices. Considerable density at both roots radiating into the lower lobes; more marked on left side with suggestive evidence of dilated bronchi at the left base.

nating rales were heard over the dull areas. Heart was pulled to the left. Both flat and stereoscopic roentgenograms (Fig. 5) showed clear apices and considerable density of both roots radiating into the lower lobes, more marked on the left side with suggestive evidence of possible dilated bronchi at the left base. Bronchoscopy by Dr. E. Danziger showed a widened left bronchus with pus coming from the lower lobe.

While at the hospital the patient did not have any constitutional symptoms of toxemia. He gained in weight normally; fifty sputum examinations were negative; urine, Wassermann and tuberculosis complement-fixation were all negative. Cough, however, was

of hemoptysis; cough was distressing. Sputum averaged 180 c.c. in twenty-four hours and was at times fetid. Her temperature, pulse and respiration remained normal. The sputum was free from tubercle bacilli. The urine was negative. Von Pirquet was slightly positive on two occasions and tuberculosis complement-fixation was 2 plus. Roentgenological examination (Fig. 4) revealed dense shadow in the region of the left lower lobe, with heart pulled to the left, but the apices were clear.

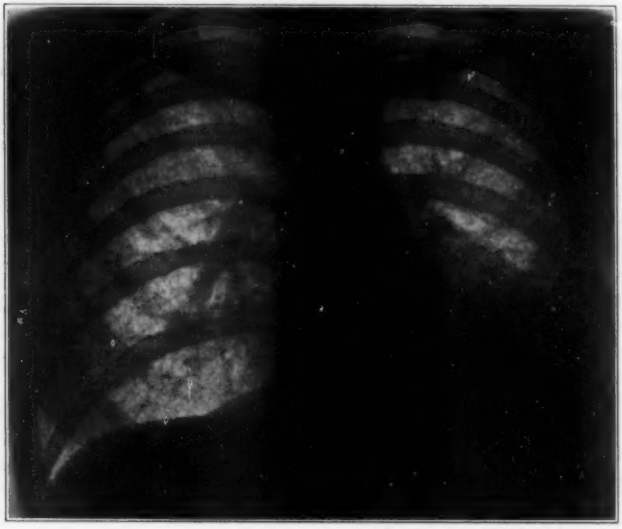


FIG. 4.—Case F. B. Note clear apices. Marked bilateral hilus changes. Dense homogeneous shadows at left lower lobe. Heart pulled to left.

On account of the unilateral lower lobe involvement, clear apices on physical and roentgenological examinations, the negative findings in the sputum, the excellent health in spite of distressing cough and expectoration of long duration and the absence of constitutional symptoms of toxemia, a diagnosis of bronchiectasis, possibly due to thickened pleura, was arrived at.

CASE VIII.—J. L., aged seventeen years, schoolboy, admitted September, 1918.

Family and previous personal history unimportant.

Present Trouble. Began five years ago with moderate cough and expectoration, which greatly increased in severity, so that the cough is now distressing and the sputum profuse, extremely fetid, frequently blood-streaked and brought up in paroxysms of distressing cough, usually early in the morning, influenced by posture. He gained normally in weight, going hand in hand with his growth in

height, and is vigorous and healthy otherwise. He does not remember ever having had constitutional symptoms such as chills, fever, sweats and tachycardia.

On examination we found a very well-nourished young adult, nose markedly bulbous, eyelids puffy, lips, cheeks and nails markedly cyanosed and fingers exquisitely clubbed. Respiratory excursions were markedly diminished throughout the left chest and a dull note on percussion was elicited over both lower lobes, more extensive and marked on the left side. The auscultatory signs suggested the presence of extensive excavation or sacculation over the left lower lobe, and increased whispered voice and many large moist conso-

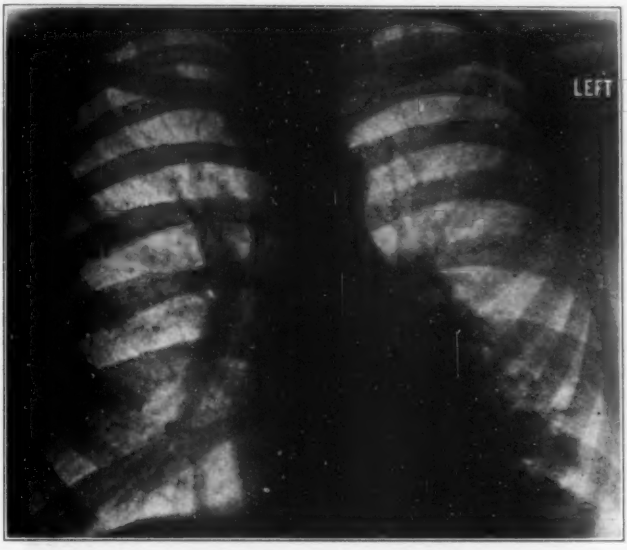


FIG. 5.—Patient J. L. Note clear apices. Considerable density at both roots radiating into the lower lobes; more marked on left side with suggestive evidence of dilated bronchi at the left base.

nating rales were heard over the dull areas. Heart was pulled to the left. Both flat and stereoscopic roentgenograms (Fig. 5) showed clear apices and considerable density of both roots radiating into the lower lobes, more marked on the left side with suggestive evidence of possible dilated bronchi at the left base. Bronchoscopy by Dr. E. Danziger showed a widened left bronchus with pus coming from the lower lobe.

While at the hospital the patient did not have any constitutional symptoms of toxemia. He gained in weight normally; fifty sputum examinations were negative; urine, Wassermann and tuberculosis complement-fixation were all negative. Cough, however, was

distressing and sputum averaged 200 c.c. in twenty-four hours, extremely fetid and frequently blood-streaked.

CASE IX.—M. G., schoolboy, aged eighteen years, admitted March, 1918.

Family and previous personal history irrelevant.

Present Illness.—Began two and a half years ago with cough and expectoration, which gradually increased in severity until six months ago, when the sputum averaged about 400 c.c. in twenty-four hours and was often blood-streaked. Despite the absence of constitutional symptoms of toxemia a diagnosis of tuberculosis was made and he was sent to us for treatment.

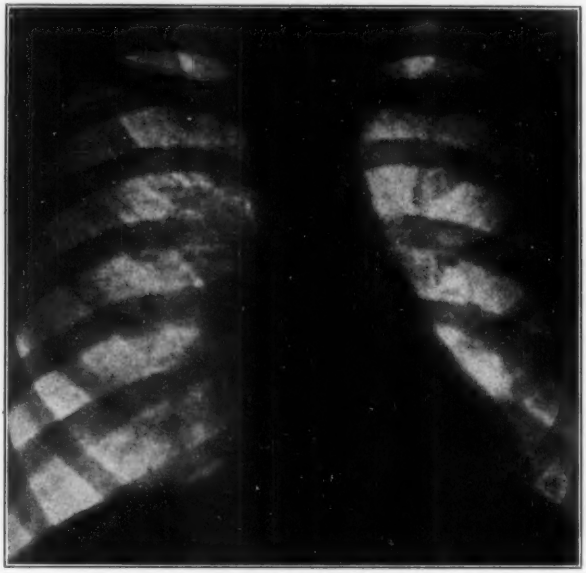


FIG. 6.—Patient M. G. Note clear apices. Marked hilus changes radiating into the lower lobes on both sides.

On admission the patient was well nourished, cyanotic, suffused expression, nose bulbous, markedly clubbed fingers. Physical exploration of the chest disclosed dulness over both lower lobes with greatly exaggerated breathing and many large moist rales with increased whispered voice over the dull areas. No pathological changes could be discerned at either apex. There was a soft systolic murmur at the apex of the heart, but it was not transmitted.

While at the hospital the temperature, pulse and respiration remained normal, but cough and expectoration were very distress-

ing, sputum averaging 450 c.c. in twenty-four hours; markedly fetid and brought up in paroxysms of distressing cough. No tubercle bacilli could be found in the sputum on numerous examinations.

The Wassermann and tuberculosis complement-fixation and the urine were negative. Roentgen-ray examination (Fig. 6) revealed clear apices and marked hilus changes radiating into the lower lobes. Bronchoscopy by Dr. E. Danziger showed a widened right bronchus, with pus coming from the lower lobe.

DISCUSSION. Bronchiectasis is very often confused with pulmonary tuberculosis because many of the symptoms, physical signs and, at times, the roentgenograms of the two bear a striking resemblance to each other. It is apparent that a differential diagnosis is urgently called for, since the patient may be detained as a germ carrier by diligent health officers. The prognosis is also more favorable in advanced tuberculosis.

The factors entering into the causation of bronchiectasis have been variously described. As early as 1838, Corrigan insisted that cirrhosis of the lung was the usual cause of bronchiectasis. A few years later Charcot pointed out that bronchiectasis occurs as a sequel of bronchopneumonia, in which there was a destruction of the muscularis and elastic coats of the bronchi.

The consensus of opinion at the present time is that bronchiectasis is due to a combination of causes within the bronchi and causes external to the bronchi. Among the causes of bronchiectasis emanating from within the bronchi, acute and chronic bronchitis, pertussis and foreign bodies are best known. In such cases there exists an inflammatory process in the walls of the bronchi due to local infection which tends to paralyze the underlying muscle tissue. The cartilages of the bronchi do not form perfect rings, *i. e.*, yellow elastic tissue joins the ends of the cartilage to complete the ring, and the amount of cartilage in each ring diminishes as the bronchi subdivide into the branches of smaller caliber.[1] During cough the pressure within the bronchi may rise from normal—2 mm. of Hg. to 100 mm. of Hg. and even higher.[2] The increased pressure, exerted upon the paralyzed musculature and incomplete cartilaginous rings, tends to dilate the bronchi at their most vulnerable points.

Bronchiectasis is also the characteristic sequel of an obstructed bronchus produced by the impaction of a solid foreign body. The local irritation and subsequent infection thus produced causes an increased secretion beyond the point of obstruction, which can never be completely expelled, and a fermenting residue remains. A septic bronchitis is thus produced and the inflammatory changes

[1] Gray, H.: Anatomy, p. 1197, Lea & Febiger, Philadelphia and New York, 1910.
[2] McPherdan, A.: Osler's Modern Medicine, iii, 636, Lea & Febiger, Philadelphia and New York, 1907.

decrease the tonicity of the bronchi. The chronic inflammatory process spreads to the peribronchial tissue and then to the lung, with the inevitable result of pulmonary fibrosis, shrinking of the lung tissue and dilatation of the affected bronchi. The rending effect of the cough in case the obstruction is incomplete further augments the bronchiectasis.

Chronic interstitial pneumonia and thickened pleura of non-tuberculous origin are the extra bronchial causes of bronchiectasis. In chronic interstitial pneumonia, fibrous growth replaces the normal texture of the parenchyma, and more or less collapse of that part of the lung is produced. The connective tissue thus formed, by virtue of its contraction, tends to dilate the nearest bronchi. This mechanism is further augmented by the inspiratory act which permits the atmospheric pressure to dilate the bronchi, traversing the collapsed and non-expanding lung tissue.

It is conceivable that the recession of the chest wall during the act of inspiration is a most potent factor in dilating the already weakened bronchi. It is well known that firm pleuritic adhesions binding the collapsed and fibrosed lung tissue securely to the chest wall are almost invariably found in these cases. The inspiratory recession, therefore, causes the chest wall to pull directly on the walls of the bronchi. When dilatation of the bronchi is once begun the stagnating bronchial excretion by its devitalizing actions markedly decreases the tonicity of the bronchi, and some passive dilatation is also produced. These mechanisms of bronchiectasis similarly hold good in cases of old standing empyemata and greatly thickened pleuræ associated with changes in the vesicular texture of the underlying lung.

In the diagnosis of bronchiectasis the history of the onset is most important. In bronchiectasis resulting from causes other than a foreign body the symptoms appear most insidiously. The patient has usually been coughing and expectorating for many years following a pneumonic process. He gives no history of constitutional symptoms of toxemia such as tachycardia, recurring chills, fever and sweats, nor does he claim to have lost in weight, as is the case in tuberculosis. He does not complain of lassitude in the afternoon hours and leads a moderately active life. Hemoptysis at once considered pathognomonic of tuberculosis, occurs almost as frequently in bronchiectasis. The excessive amount of sputum expectorated is not as important as the manner in which it is brought up. In bronchiectasis it is raised spasmodically in mouthfuls, usually in the early morning hours after a restful night. The expectoration is most markedly influenced by posture. The abundant sputum may be fetid, but not necessarily so, and its separation into three layers is of no diagnostic significance, since sputum of most advanced tuberculous, when abundant, will exhibit the same phenomena. The patient usually presents a suffused

expression, puffy eyelids and bulbous nose in contradistinction to the emaciated, flushed appearance of the tuberculous.

Since bronchiectasis is secondary to a variety of chest conditions the physical findings will frequently be those associated with the condition preceding bronchiectasis. Physical examination may be quite disappointing in the early stages of the disease and signs usually noted are similar to those of chronic bronchitis. It is only later in the disease that clubbed fingers and marked pulmonary osteo-arthropathy are noted. This occurs more frequently in bronchiectasis than in any other pulmonary affection, save abscess of the lung. The ordinary cases of bronchiectasis, however, are not seen very early, and when they do present themselves for treatment, the signs most usually elicited are impaired resonance over the affected area, with auscultatory evidence of congestion, sacculation or cavity formation, most usually unilateral and almost invariably at the lower lobe. The hemothorax affected shrinks in all diameters and the mediastinum is pulled to the side affected just as frequently as in tuberculosis. The upper lobe of the same side may share the pathological changes of the lower lobe,[3] but when the disease continues and passes, so to say, to the other side it is again the lower lobe that is first affected.

Pathological changes in pulmonary tuberculosis almost invariably spread from above downward. In bronchiectasis the reverse is true. It is a fact of extreme importance to note that bronchiectasis most usually affects the lower lobe, and is most frequently unilateral. Its occurrence in an upper lobe exclusively has been recorded, but is very rare indeed.

Laboratory findings at times may not be of assistance in the differential diagnosis, except, of course, when tubercle bacilli are found in the sputum. Guinea-pig inoculation with the sputum in question may rule out active tuberculosis.

Roentgenograms, although invaluable in certain cases, may be very misleading at times when the disease has spread so as to affect the upper as well as the lower lobe. When showing clear apices the plate is of extreme diagnostic value in ruling out tuberculosis. Slight shadows at the base, however, which is all we frequently see in typical cases of bronchiectasis, cannot usually be correctly interpreted and very often definite sacculations, found on physical examination and confirmed by anatomical investigation cannot be seen either on flat or stereoroentgenograms.

The tuberculosis fixation test, at first heralded as being of extreme diagnostic importance, has misled us in a few cases, and should therefore not yet influence us in making a definite differential diagnosis.

[3] Report of Work of Pathological Department of Brompton Hospital, Tab. VIII, p. 33.

SUMMARY. A diagnosis of bronchiectasis may be arrived at only after a careful history of the case has been taken and painstaking repeated physical examinations have been resorted to. Given a patient with a history of cough and profuse expectoration of many years' duration following pneumonia, yet well nourished, leading a moderately active life, especially when no history of such constitutional symptoms as tachycardia, chills, fever and sweats can be obtained, and the abundant sputum after repeated and careful examinations does not show the presence of tubercle bacilli, it is most probable that the disease in question is not tuberculous in character, although hemoptysis may have been complained of. When this is supplemented by repeated physical explorations of the chest, which show that the lesion is to be found exclusively at either or both lower lobes and the apices are free from disease, a diagnosis of bronchiectasis may be justifiable. Guinea-pig inoculation of the sputum in question may rule out tuberculosis. Roentgenogram and at times bronchoscopy may be of assistance. Tuberculosis complement-fixation is not as yet to be relied on. It must be emphasized that extensive basal tuberculosis is most frequently a terminal condition and is associated with bilateral upper-lobe involvement and marked constitutional symptoms of toxemia.

I wish to express my indebtedness to Dr. Maurice Fishberg and Dr. Alfred Meyer, from whose services the report of the cases was taken, for their valuable suggestions.

A CASE OF ENLARGED THYMUS GLAND AND SOME REMARKS ON STATUS LYMPHATICUS.[1]

BY RICHARD COLE NEWTON, M.D.,

CONSULTING PHYSICIAN TO THE MOUNTAINSIDE HOSPITAL, MONTCLAIR, N. J.

W. S., aged twenty years, 5 feet 6 inches tall; weight, 145 pounds. A patient of Dr. William F. Grady, of Montclair, presented the following history and symptoms.

Family History. Negative.

Personal History. Negative.

Present Condition. Patient has always been well. No similar case is known to have occurred in any member of his family, immediate or remote. In the spring of 1917 the patient undertook strenuous farm work near Greenwood Lake, N. J. Once after exhausting labor he jumped into the lake when overheated. He swam a considerable distance. No immediate untoward effects were noticed, but in about two weeks he began to complain of lassitude and loss

[1] Read by title before the American Climatological and Clinical Association at Atlantic City, June 17, 1919.

of muscular vigor, with some dyspnea. (His habits were good. No tobacco, no spirituous liquors, not addicted to venery—seems to have little libido sexualis. Is athletic and fond of outdoor sports.) Being unable to work, he returned to his home in Montclair. By this time his neck, upper chest and shoulders, especially the right, had begun to swell with soft edema. There were also a number of maculæ, dark purple in color and about the circumference of a dime, in clusters over the upper sternal region. These lasted about two weeks. The lower part of the cheeks and the neck looked like those of a person with a large goiter, although the swelling was more evenly distributed than in the average goiter case. The dyspnea, loss of muscular tone, etc., gradually increased. The patient was taken to a prominent consultant in New York City. A loud double heart murmur had developed and the patient seemed very sick. The consultant declined to make a positive diagnosis. There were no symptoms especially referable to the heart beyond those mentioned above. The throat and fauces were normal. No enlargement of the tonsils or increase in adenoid tissue. No fever or chills. Appetite fair, less ravenous than usual (patient has always been a very hearty eater). No glandular enlargements noted. No pain or headache. Urine examined and found normal. No constipation or edema other than that mentioned. No sweats or tremors. Occasional tachycardia. Pulse usually about 60. The consultant thought there might be an aneurysm and advised a roentgen-ray examination. This was made by Dr. Charles F. Baker, of Newark, who found the thymus gland so enlarged that it covered all, or nearly all, of the anterior surface of the pericardium. The patient received six roentgen-ray treatments in all, at weekly intervals, starting with 3x and gradually increasing to about 10. By this time the edema had entirely disappeared. He resumed his previous habits as to various activities, dancing, playing baseball as well as basket and football, swimming, etc. In about a year the edema and dyspnea returned. The roentgen-ray treatment was resumed and the patient after nine exposures is now again free from edema. He is taking 20x and expects to take two more treatments. The patient, although he has carefully concealed the fact from his usual medical attendant, took a sharp run of about a mile to catch the last train two or three months ago. He made the distance in record time, but apparently brought on a recurrence of his former symptoms, and both he and Dr. Baker believe that the imprudence in running (with perhaps a subsequent chill from riding in the cars when overheated and exhausted from the exertion, induced the recurrence of his former symptoms). The heart murmur, although milder than formerly, is still present. The boy's general condition seems good at this writing (September, 1918).

Although there was improvement after the second series of roentgen-ray exposures just alluded to, this was only temporary.

The following extract from the records of Dr. Baker's office throws some light upon the condition, although it cannot be positively asserted that the roentgen-ray diagnosis of a tuberculous infection proves anything regarding the etiology of the thymus overgrowth.

REPORT OF ROENTGEN EXAMINATION OF W. S., JUNE 29, 1918. "Two stereoscopic plates of the chest were made, which show practically the same condition as the first two taken (some months ago). As regards the thymus, I do not think the thymus shadow is quite as large as it was in the first set of pictures."

"There is a distinct cloudiness of the left lung and the shadows of the bronchi in the apex (first and second interspaces) are clear to the periphery. In the lower portion of the upper right lobe the shadows are very dense, all of which indicates there has been an involvement of this lobe with tuberculosis.

"A comparison of the last set of plates with the former also shows a slight degree of cloudiness and fibrous-tissue deposit, but the former set of plates are not as good in this respect as the latter.

"SUMMARY. The return of the edema of the face seems to indicate there should be more therapeutic roentgen-ray treatments given, and I would suggest a careful physical examination of the chest, temperature, etc., to determine if there be an active lesion of the left side at this time."

The patient gradually lost ground. Dr. Baker asserts that no lasting benefit followed the second series of roentgen-ray exposures, nine in all, although great improvement, which it was hoped would be permanent, had followed the original six exposures. The patient seemed to have been unusually active during the extremely cold weather of the winter of 1917–18, which his attending physician thought was especially injurious to him. In the fall of 1918, after the overexertion in running for the train, previously mentioned, he began to have edema and the adverse symptoms already mentioned, especially a gradual failing of strength. Two Wassermann tests were negative. He developed an aneurysm of the aortic arch, with protrusion of the upper sternal region, and a distinct tracheal tug. Edema of the feet and ankles, hands and wrists developed, and there was excruciating pain in the right arm and shoulder. He gradually became helpless. There was nothing abnormal found in his urine. There was marked orthopnea, so that a Fowler bed had to be used for him. For the last two or three months of life the patient had to be kept under constantly repeated doses of morphin. There was no edema of the face and no maculæ present, as in the earlier part of his illness.

He died March 31, 1919, from rupture of the aortic aneurysm. An autopsy could not be obtained.

A case as rare as this accentuated with such marked symptoms seems to the writer worthy of careful study.

At the risk of being wearisome it seems necessary to give somewhat in detail a résumé of the better known observations on the nature and functions of the thymus gland:

The weight of the gland at birth is given by various writers at from 13.75 grams all the way down to one-third or less of that figure. Howland,[1] from an examination of the glands of 495 patients under five years of age, found the average weight to be from 4 to 6 grams.

Mayo and McGrath[2] make the very practical observation that inasmuch as the size of the normal gland varies within such wide limits, it is probable that with more exact knowledge "we shall be able to estimate the physiological value of the organ, not so much by its gross size or weight as by a scientific determination of its normal, subnormal or supranormal parenchymatous value." In this connection also we must not lose sight of the possibility of accidental involution from various causes.

Exactly what the thymus is meant to accomplish in the economy is largely a matter of conjecture. Sajous[19] has satisfied himself and some others that that gland is put in the body to manufacture the phosphorus needed in osseous formation. Another explanation of the function of the gland is that it controls or regulates the deposit of lime in the bones. These are examples of the statements of the bolder spirits who are willing to risk their reputations in ascribing particular attributes to this baffling little organ.

In 1614 Felix Plater[3] reported the first known case of alleged death from an enlarged thymus in an infant, and in 1659 Wharton[4] observed accidental thymus involution in animals after excessive exertion. In the case I am reporting, if excessive exertion had any causative effect on the status of the gland, it was probably that of evolution. After Wharton's discovery it was noted that chronic diseases and starvation quickly reduce not only the weight but the parenchymatous value of the thymus. And Rudberg[5] has noted the regeneration of the thymic elements after the gland had been exposed to the roentgen-rays. Friendleben[6] has stated that complete regeneration of the thymus can occur, as shown by animals overfed after nearly complete starvation.

Minute Anatomy. The gland contains two types of cells, the reticular and the so-called thymic lymphocytes. The former are considered epithelial elements, which result from a direct transformation of the primary thymic anlage, and during the entire existence of the organ maintain their epithelial character. The corpuscles of Hassall, which are small concentrically striated bodies peculiar to the thymus, are to be considered as modified epithelial reticulum cells. The lymphocytes in the thymus have called forth much discussion into which we have no time to enter. Clinically they are of special interest by reason of their susceptibility to change. It is these cells that are melted away, as it were, by the roentgen-rays and presumably it is the regeneration or recreation of these

cells which causes a regrowth of the thymus body. Eosinophiles have been found in the thymus of very young children. It is denied that these cells exist in the adult thymus in men or animals. Pappenheimer[7] believes that the presence of these cells designates a definite stage of secretory activity similar to that observed in the hypophysis and parathyroids. Rudberg[5] observed that after exposure to the roentgen-rays there was an invasion of pseudo-eosinophilic cells synchronously with the destruction of the small cells of the thymus.

Growth and Involution. Here again many theories are advanced. Mayo and McGrath[1] say that lack of knowledge as to the importance of the thymus in later life is a source of confusion in the diagnosis of various altered conditions of the body. There are remnants of thymic tissue present in man even in old age. Just what their import may be is very doubtful. The older pathologists and anatomists regarded them as merely vestigial, as indeed they regarded the hypophysis and the pineal gland. Of course, I do not refer to the mythological age of medicine when the last-named gland was considered the residence of the human soul. It has also been stated that the thymus was "persistent" or hyperplastic in association with certain diseased conditions. McAuliff[16] says: "The thymus like the thyroid does not seem to be so intimately connected with sexual characteristics, but does have some association as it is persistent in eunuchs. Possibly like the pineal it has a limited function in the growing body previous to puberty. This is an aspect of the subject that demands further study. Even the normal involution of the average thymus is still undetermined. Some authors maintain that the principal growth in weight and function takes place between the first six months and the third year of life while others assert that not until the tenth or fifteenth year is the highest point reached. Most investigators believe that thymic growth takes place in postfetal life, but when this growth reaches its acme and how long the gland is physiologically active is still uncertain. Hart[8] says in the case of physiological involution there is a genuine growth of fat tissue, which can yield at any time to a new formation of parenchymatous islands, while in the pathological involution of the gland there is reactive connective-tissue growth and sclerosing which in all severe cases leave irreparable changes in the organ. Some observers, however, believe that the involution of the gland is due to a simple cirrhosis. The epithelial portion of the organ naturally proves the more resistant and is said to assume the active role of cirrhosis. Rudberg[5] has called attention to the regeneration of the thymic elements after exposure to the roentgen-rays.

Physiology. Here again the mountain has labored with rather insignificant results. Still, certain valuable conclusions have been reached. It has been asserted that, as an accelerator of the pulse and a depressor of the blood-pressure, the thymic extract (also the thyroid extract) acts antagonistically to the extract of the chromaffin

system and that an injection of the expressed juice of the thymus into animals may result fatally after causing a fall in blood-pressure and the pulse-rate. The thymus was removed from puppies on the tenth day of life with no apparent immediate results. There was growth and weight increase in both the puppies which had been treated and the controls, but the increase in the former was fatty instead of muscular. Their bones were soft; they were weak and listless. There was a decrease in intelligence. They ate what was set before them without discrimination. After three or four months they fell behind the controls in growth. Their bones grew softer, they suffered from spontaneous fractures and frequent convulsions and became finally completely idiotic, and after six to fourteen months died in coma. At autopsy their brains were swollen and edematous, bones undersized, soft and pliable, with thick epiphyseal cartilages. Microscopically there was osteoporosis and cartilaginous overgrowth. Chemically the bones showed 32.34 per cent. of calcium while those of the controls showed 65 per cent. Similar results were noted in another experiment on puppies except there was less mental hebetude present. The picture of thymoprivia was typical and similar to advanced rickets, and due, as Matti[9] claims, to the impaired capacity of the excessive new bony tissue to assimilate calcium. No correlation between the status of the blood and the thymic changes was observed in extra-uterine life. The physiological decrease of the lymphocytes and the increase of the neutrophilic leukocytes occurred later than in the controls. After thymectomy there occurs a microscopic and macroscopic hypertrophy of the intrasuprarenal part of the chromaffin system, with indications that the process is correlative with the loss of the thymus. The thyroid showed slight increase in weight. There seemed to be a reciprocal relation between the thymus and the spleen. The hypophysis appeared to be relatively larger, although it was small in the stage of cachexia. The liver and pancreas were apparently enlarged. These experiments seem to show conclusively that the thymus is not a superfluous organ in growing dogs. In some cases compensatory activity of the related organs and the accessory thymic lobes may prevent the occurrence of symptoms after thymectomy. It seems to be established that the thymus, thyroid and parathyroids are closely related in function. Bourneville[10] noted the absence of the thymus in 25 out of 28 mentally defective children. Other experiments on dogs show that thymectomies to adult animals are without obvious effects and the assumption that the thymus and the chromaffin system are antagonistic in function seems at least plausible. The former inhibits and the latter excites the sympathetic nervous system.

Popper[11] assumes that the thymic extract influences clot-formation and should be taken into account in considering vascular thrombosis

as a possible cause of cardiac weakness and sudden death in cases of hyperthymization, whether occurring in men or animals.

Wiesel[12] remarks that the contention that the signs of hyperthymization are rather due to resorption than to specific intoxication should be received with great consideration.

Pathology. Many causes for pathological thymic conditions have been noted, the gland may be congenitally absent, certain of the changes observed in it may have been postmortal, while the infectious diseases of children, overexertion and starvation, as already noted, may obliterate it, as well as circulatory diseases, acute inflammations, syphilis, tuberculosis and neoplasms. Frequently after death the parenchyma may be found hollowed out, which is alleged to be due to autolysis caused by the proteolytic thymic ferment, as demonstrated by Kutscher.[13] It is held that a strictly normal thymus is rare in the human body. Many of the older autopsies were inconclusive, owing to lack of proper microscopic confirmation of the gross anatomy. Hemorrhages in the thymic body are not rare. A man who died suddenly three weeks after castration had a clot in the thymus. Small hemorrhages have been found in the gland of the newborn, due probably to difficult labor. The infections, phosphorus poisoning, hemophilia and so on have been given as the cause of thymic hemorrhage. Three or 4 per cent. of 350 autopsies showed syphilitic infection of the thymus. It is claimed that syphilitic infection of the thymus may be the sole manifestation of the disease. Primary tuberculosis of the gland does occur, but this lesion is usually secondary to tuberculosis of the bronchial glands, general miliary tuberculosis or caseous pneumonia. Tubercle bacilli have been found in the thymic tissues. The condition is not generally recognized during life. New growths of various sorts have been found in the thymus. Cysts of the gland have been found in normal as well as in pathological conditions.

Status Lymphaticus. Richardson[20] says that in most cases when there is marasmus or a condition of malnutrition the thymus gland is quite small. Conversely most of the status lymphaticus cases are fairly well nourished.

Of the large number of infants dying suddenly, sometimes with and sometimes without one or more preliminary suffocative attacks, many at least must have succumbed to pressure, especially upon the trachea, which has been found flattened at different levels. There has also been pressure upon the innominate vessels where these cross the trachea. The bronchi have also been found flattened and atrophy of the cartilaginous tracheal rings from pressure has been noted. Extension of the head and neck naturally tends to increase the dyspnea. Mayo[1] reports two successful operations for relief of thymic pressure. In one case he only removed the right lobe, in the other, one-half of this lobe, which weighed 10 grams. Death

from thymic pressure is strenuously denied by some; one observer asserts that in 2341 postmortem examinations of children, 83.1 per cent. of whom were nurslings under one year of age, not one death could be fairly attributed to thymic pressure. Dysphagia from pressure on the esophagus has been noted. While the cause of so-called thymic death, not to mention asthma, tetany, laryngismus, stridulus and other suffocative manifestations formerly attributed to thymic enlargement, has not been definitely settled, it would appear that those who deny the causative connection of pressure *in toto* are taking too strong ground. Mayo and McGrath[1] say that the gland can act in a mechanical way in causing severe disturbance, while they admit that sudden death solely from enlargement of the thymus is extremely rare, and, of course, the condition that is presumed to have caused the thymic hyperplasia has no doubt predisposed the affected person to sudden cardiac or suffocative dissolution. Yet considering the favorable results of the few cases of thymectomy in children reported (and there seem to be less than a dozen of them) it must be admitted there is a good deal to be said in favor of the operation and the relief of pressure. When the Mayos can point to 1000 or 2000 thymectomies done in their own clinic, as they did some years ago to 5000 thyroidectomies done in that famous clinic, they will no doubt be able to give us something quite definite regarding the thymus, its functions and its diseases. What seems necessary at the present writing is more bedside and operative work. Nor is this the only hitherto unsolved problem in medicine that cannot be brought to a clear and demonstrable solution without a closer conjunction of the efforts of clinical, laboratory and pathological workers. Now, alas! working usually quite independently and sometimes, at least, unable to judge of their own limitations.

In many sudden deaths, where there was no apparent cause, and also in some seriously diseased conditions, an enlarged, persistent thymus has been observed, either alone or coexisting with certain abnormal conditions in the lymphatic system and other bodily organs. These changes, as a whole, were originally grouped together under the title of status lymphaticus; but recent observers have subdivided this syndrome into three subdivisions as follows: status thymicus, status thymicolymphaticus and status lymphaticus. These three conditions are so named according to the size and the apparent activity of the thymus. The status thymicus has already been briefly discussed. In it the size of the thymus is usually larger than in status thymicolymphaticus and is not accompanied by marked changes in the lymphatic system. In the status thymicolymphaticus there is a general hyperplasia of the lymphatic tissues throughout the body, especially the tonsils and the lingual, pharyngeal and cervical glands. While in the status lymphaticus the thymus is not enlarged and may even be subnormal in size, nevertheless

the size of this organ is probably not of itself a criterion of the systemic lesions present in these three allied conditions.

Most of the cases of so-called thymic death occurred in adults; but some have happened in infancy and early life, and probably some of them were not attributed to the right cause. Among the conditions under which these sudden deaths have occurred were bathing, general and local anesthesia, operations (often trivial), flogging, coitus, mental excitement, ordinary walking and even rest.

Among the diseases having a more or less close relation to the thymic and general bodily conditions under discussion are exophthalmic goiter, Addison's disease, diphtheria, tetanus, eclampsia, eczema in children, myasthenia, osteomalacia, burns, etc. Bartels[21] reports that in 122 cases of suicide 36 per cent. were cases of status thymicolymphaticus, 26 per cent. were cases of lymphaticus and in 20 per cent. there were some signs of lymphatism. Diphtheria is one of the diseases often associated with lymphatism. Most cases of tetanus and a number of cases of eclampsia in females are associated with status thymicolymphaticus. Uhlenhuth[17] says the relation of the thymus to tetany may possibly explain the occurrence of tetany during pregnancy; while the parathyroids of the mother may be sufficient to prevent tetany from her atrophied thymus, they may not be sufficient to prevent tetany from the excess of thymus substance furnished by the fetus to the blood of the mother. Thymicolymphaticus, as intimated above, is marked by more or less general involvement of the lymphatic system and also with hypoplasia of the vascular system and the adrenals. Virchow[14] had already described the hypoplasia of the vascular system in 1872 as the "chlorotic constitution." Hyperplasia of the lymphatic system, on the other hand, may be due to infection and improper hygiene. As Kolisko[15] has remarked, the entire lymphatic system can become hyperplastic in consequence of rachitis. Richard Bright first sketched out status lymphaticus in 1838. Oldmacher[18] states that status lymphaticus is divided into the rachitic and non-rachitic types, and notes especially the epiphyseal changes in the bones in the first-named division. Many of the symptoms of so-called lymphatism, as laid down in the literature, seem to merge into each other, and their apparent divergences may in many cases be due to chronological or accidental changes in the same disease. This we might reasonably expect in so changeable an organ as the thymus, both in health and disease. Galatti directs attention to the peculiar tendency to edema in status lymphaticus. There may be, he says, edema of the brain, as noted in the thymectomized puppies already mentioned, as well as eczema and pasty complexion in man. The external edema in our case was, of course, the most prominent symptom. Oldmacher, in this connection, calls attention to edema of the lungs, which he has observed in lymphatic epileptics, dying abruptly in a single seizure or sinking into status epilepticus; and claims that

slight factors like moderate auto-intoxication may activate this tendency in lymphatism. He adds that should cerebral edema cause pressure on the floor of the fourth ventricle sudden death would supervene. He is prone to attribute lymphatism, generally speaking, to some slow-acting systemic poison. Mayo lays down the proposition that the thyroid is an organ of defence and that more or less aid in this function is received from the normal thymus. And it would appear to be firmly established that in early life, at all events, a normally acting thymus is essential to proper development. It will be observed that Mayo[1] only removed part of the overgrown thymus, just as only part of the enlarged thyroid is removed by operation. Why ablation of part of an improperly functioning gland should obviate its overaction is difficult to explain unless it may be due to removal of a large part of its secretory elements, and whether this operation does correct temporarily or permanently the vascular hypoplasia, the changes in the chromaffin system and so forth found in lymphatism has, so far as I know, not yet been definitely ascertained.

We should notice, before closing, that Gowers urged prophylaxis against rickets as a preventive measure against epilepsy, and Oldmacher takes similar ground regarding tetany, spasm of the glottis and eclampsia; conditions accompanying, if not always due to lymphatism; while Mendel attributes rickets to disturbance of the internal secretion of the thymus gland. Hence, while this study of ours has not been as conclusive as we could wish, it tends to emphasize the fundamental importance of laying the foundation for normal, mental and bodily development by insisting on the inalienable right of every infant to be nourished at the breast of a healthy woman.

What other practical conclusions may we draw from the foregoing? The roentgen-ray has removed some at least of the uncertainties of the diagnosis and has seemingly favorably influenced the treatment. The fear that operation will be almost inevitably fatal has been largely removed by the few successful cases reported. These were all in infants so far as I can learn. Whether adults with enlarged thymus should be submitted to the risks of operation has not apparently been determined. However, as said above, of the alleged cases of thymic death the large proportion are adults.

There should be a more strenuous effort made to ascertain whether something definite cannot be done to benefit these cases, as a whole, by hygiene and diet rather than by medication.

It is quite likely that anomalies in the structure and size of the thymus are due rather to a constitutional condition than to primary disease of the organ itself. And these conditions may be brought about by a number of causative factors. Ewing[22] emphasizes the fact that there are the stages of hyperplasia and hypoplasia of the thymus and the lymphatic system. These properly carried out

seem to be normal in the human body. Interference with or undue activation of these processes appears to cause the condition which is known as status lymphaticus, which appears to leave, generally speaking, some permanent defects like thin arterial walls, small heart and an excess of lymphoid tissue and may or may not be characterized by the typus feminis in males in the conformation of the body. Our patient did not evince these outward physical characteristics, but he had the tendency to edema and to aneurysm so well marked in many of these cases.

It is fair to suppose that in time the greatly enlarged thymus in this case would have atrophied, and had the aneurysm not occurred as a complication, he might have enjoyed a number of years of useful life. The aneurysm itself was quite probably caused by overexertion, perhaps by the strenuous run already mentioned in a person with congenitally weak and attenuated arterial walls.

That the roentgen-rays were so efficient at first and so ineffective afterward was, it may be assumed, because at the first treatment the aneurysm had not developed but that at the second it had become a controlling factor in the morbid conditions.

My thanks are due to Drs. Baker and Grady for material help in preparing this paper.

REFERENCES.

1. Collected papers, Mayo Clinics, 1912, p. 567.
2. Ibid., p. 568.
3. Obs. in hominis affectibus plerisque, etc., 1614, No. 1, iii, 172.
4. Adenographia Amsterdam, 1659.
5. Arch. f. Anat. u. Entwickl., 1907, pp. 123–124.
6. Die Physiologie der Thymus, Frankfurt a. M., 1858.
7. Jour. Med. Res., 1910, xxii, 1.
8. München. med.Wchnschr., 1918, 55. Jahr., pp. 668–774.
9. Mitt. a. d. Grenzgeb. d. Med. u. Chir., 1912, No. 45, xxiv, 665–821.
10. Progrès méd., 1900, xxix, 289.
11. Sitzungsb. d. k. Akad. d. Wissensch. Math.-naturw. Kl., 1905, 3. Abt., cxiv, 538–546.
12. Ergebnisse der pathol. Anat. von Lubarsch u. Ostertag, 1912, 15. Jahr., 2. Abt., 416–782.
13. Ztschr. f. physiol. Chem., 1901–2, p. 114.
14. Virchows Arch., 1853, vol. v.
15. Handb. d. ärztl. Sachverständigen-Tätigkeit, 1906, ii, 701.
16. Jour. Am. Med. Assn., January 1, 1916, p. 19.
17. Jour. Gen. Physiol., Baltimore, September, 1918, No. 1, vol. i.
18. Wood's Ref. Hand-Book.
19. New York Med. Jour., May 11, 1918, paper by Garretson.
20. Massachusetts Gen. Hosp. Case Records, 1918, Case 4492.
21. Jour. Am. Med. Assn., November 9, 1918, p. 1528.
22. Ibid., pp. 125 et seq.

TRANSITIONAL LEUKOCYTOSIS AND ITS DIAGNOSTIC VALUE IN CHRONIC APPENDICITIS.[1]

By G. A. Friedman, M.D.,

CLINICAL PROFESSOR OF MEDICINE, NEW YORK POLYCLINIC MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN, BETH DAVID HOSPITAL; ATTENDING PHYSICIAN IN DIGESTIVE DISEASES, VANDERBILT CLINIC; GASTRO-ENTEROLOGIST, GOUVERNEUR HOSPITAL, NEW YORK.

It is needless to emphasize the fact that there are occasions when it is difficult to correctly diagnose chronic appendicitis. In some instances after the most earnest attempts to establish this diagnosis the clinician seeks an exploratory laparotomy, and, occasionally, the surgeon, too, is unable, even on inspection, to decide whether the removed appendix is diseased or not, and, consequently, consults the pathologist.

Clinically, the tenderness elicited both by pressure on McBurney's and Morris's points and by the methods of Meltzer and Bastedo is well known to the internist and is frequently of great aid in the diagnosis of acute appendicitis. This is not, however, of great value in chronic cases, and, furthermore, does not always indicate true appendicular disease. It may mean, often, for instance, peri-appendicular adhesions. Moreover, roentgen examination of the appendicular region is not sufficiently conclusive. One must agree with Carman[2] and Case[3] that although stagnation of the contrast meal in the appendix, or a visualized appendix in roentgenograms, does not necessarily mean a pathological appendix, yet an appendix may be markedly diseased without being visible in the roentgenograms. Other roentgen signs of appendicitis, such as pressure-points in the ileocecal region or elicited under the fluoroscope, spastic colon, intestinal stasis and even shadows of concretions in the appendix, do not always indicate appendicitis.

A hyperleukocytosis or a polynuclear leukocytosis, or both, when present, are valuable diagnostic aids in acute appendicitis as their presence frequently points to a really more or less acutely diseased appendix. However, such findings are too often absent in chronic appendicitis. Occasionally, however, a leukopenia may be found both in acute and chronic appendicitis.

The routine examination of blood of the so-called dyspeptics, many of whom were actually suffering from chronic appendicitis, suggests that in the differential count there is an important aid in the diagnosis of chronic appendicitis provided an enumeration of the

[1] Read before the American Gastro-Enterological Association, Atlantic City, N. J., June 10, 1919.

[2] The Roentgen Diagnosis of the Alimentary Canal, W. B. Saunders Company, Philadelphia and London, 1917, p. 513.

[3] Roentgen Examination of the Appendix, New York Med. Jour., 1914. No. 4 p. 167.

large mononuclears and the transitional leukocytes is made. There is a definite increase in the number of these cells in the blood of those suffering from chronic appendicitis, although this increase may be slight at times. It may be justly designated as a transitional leukocytosis. Although not an invariable finding it has its definite value. It is found in chronic appendicitis more frequently than a hyperleukocytosis or a polynuclear leukocytosis, and more often than the positive roentgen signs. It may be actually observed and clinically demonstrated that a transitional leukocytosis points to appendicular disease. A transitional leukocytosis is absent in peptic ulcer, cholecystitis, renal colic, etc. (see Tables IV and V). If present in these or in other abdominal conditions there is a chronic appendicitis complicating the existing condition.

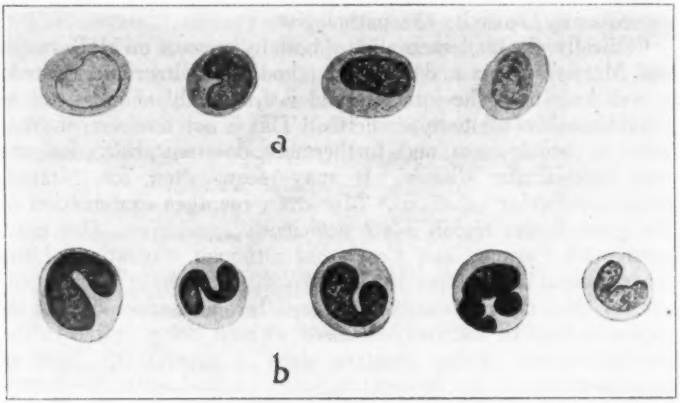


FIG. 1.—Showing the types of cells enumerated as large mononuclears and transitional leukocytes.

The transitional leukocytes differ from the large mononuclears in that the nucleus of the transitional forms assume a horseshoe shape. Hematologists disagree as to the proper grouping of the transitionals when enumerating them in the differential count. Wood,[4] for instance, believes that the transitional leukocytes should be classed with the neutrophiles and should not be considered as a separate group. Naegeli,[5] on the other hand, states that the transitionals and the large mononuclears belong to the same group and should be thus enumerated. Naegeli's claim is substantiated by the fact that there is no difference either in the protoplasm of

[4] Chemical and Microscopic Diagnosis, D. Appleton and Co., New York and London, 1911, p. 103.

[5] Blutkrankheiten und Blutdiagnostik, Verlag von Veit und Co., Leipzig, 1912, p. 180.

the transitionals and the large mononuclears or in the structure of the nuclei, save for their form and curving (Fig. 1). Pappenheim,[6] however, was the first to demonstrate that a transition from mononuclears to neutrophiles never occurs, and, therefore, mononuclears must be considered as a special ripe form. The percentage of transitionals in normal blood, according to Wood, varies from 2 to 4 per cent. while the percentage of large mononuclears is 1 per cent. These percentages seem to be quite constant. The total number of transitionals and large mononuclears in 100 white blood cells may therefore be considered as 5. The absolute number of large mononuclears and transitionals in a normal white cell count of 10,000 per c.c. will be 400 transitionals and 100 large mononuclears. In other words the transitional formula, sometimes called relative transitional formula, will be 5 and the absolute transitional formula 500. The terms relative formula and absolute formula will be used to indicate the relative and absolute increase of leukocytes belonging to the transitional group. In chronic appendicitis the relative formula, although frequently high, does not necessarily run, for obvious reasons, parallel with the relative formula. Rieux[6] found a marked increase in large mononuclears (absolute numbers in the blood from 1300 to 1900) in severe perityphlitis. But he, like Naegeli, grouped the transitional forms with the mononuclears. I was not aware, however, of Rieux's findings when in a previous communication[7] I first emphasized the importance of an increase of large mononuclears and transitionals as a diagnostic aid in chronic appendicitis. The blood in all instances was collected for examination before breakfast or six hours after a meal, in order to exclude a digestive leukocytosis, and not less than 200 cells were enumerated. All were stained by the Jenner method. A white-cell count above 10,000 per c.c. is considered a hyperleukocytosis and in the differential anything above 75 per cent. a polynuclear leukocytosis. A count below 500 white cells to the cubic centimeter indicates a leukopenia. In nearly all cases the blood of adults was examined.[8]

An adequate explanation cannot be given at present for the extreme frequency of a transitional leukocytosis in chronic appendicitis. According to all hematologists large mononuclears are produced in the bone-marrow and as transition forms belong to the same group, they, too, possibly, have the same origin. It may be suggested, however, that the transitional leukocytosis in chronic appendicitis is due to a constitutional disturbance which may possibly also predispose to appendicitis. This idea is strength-

[6] Quoted by Naegeli, p. 180.

[7] Friedman, G. A.: The Difference in the Morphology of Blood in Gastric Ulcer, Duodenal Ulcer and in Chronic Appendicitis, Am. Jour. Med. Sc., 1914, No. 4, cxlii, 540.

[8] To shorten tables, the complete counts have purposely been omitted as small lymphocytes, large lymphocytes, eosinophiles and basophiles have no direct bearing.

ened by the facts that a hyperleukocytosis when present before operation disappears after removal of the appendix and a transitional leukocytosis often does not disappear for months and even years after the appendectomy. This persistence of a transitional leukocytosis recalls the erythrocytosis described[9] as often occurring in chronic non-bleeding duodenal ulcer, and which also probably is due to a constitutional disturbance, likewise persists after the various surgical procedures.

The present study is based upon 65 cases; 14 of these presented themselves for examination for ailments other than appendicitis, their appendices having been removed previously at the advice of other physicians (see Table VI). For the operative findings I am indebted to the following surgeons: Dr. John A. Bodine, 29 cases; Dr. A. O. Wilensky, 11 cases; Dr. Leo Buerger, 10 cases; Dr. A. A. Berg, 7 cases; Dr. Charles N. Dowd, 2 cases; Dr. Charles Peck, 2 cases; Dr. M. S. Kakels, 1 case; Dr. James L. Russell, 1 case; Dr. Charles R. Hancock, 1 case; and Dr. John B. Deaver, 1 case. For the pathological reports of 10 cases I am indebted to Dr. C. H. Bailey and for the drawings to Mr. Alfred Feinberg.

TABLE I.—APPENDICITIS: WHITE BLOOD AND OPERATIVE FINDINGS.

Case number.	White blood corpuscles.	Polynuclears, %.	Large mononuclears, %.	Transitional leukocytes, %.	Relative transitional formula.	Absolute transitional formula.	Operative findings.
1	9,200	35.5	2.0	5.0	7.0	644	Constricted and adhesions.
2	16,800	75.5	6.0	9.0	15.0	2520	Chronic and adhesions.
3	4,600	67.0	3.5	3.5	7.0	322	Constricted and adhesions.
4	7,800	65.0	5.5	5.5	11.0	858	Gangrenous.
5	24,000	77.5	6.0	4.0	10.0	2400	Fibrinous.
6	8,400	55.0	2.5	11.0	13.5	1134	Chronic.
7	6,000	57.0	1.0	6.0	7.0	420	Chronic.
8	8,000	72.0	1.0	6.0	7.0	560	Chronic.
9	8,000	62.0	3.0	7.0	10.0	800	Chronic and adhesions.
10	11,300	68.0	0.5	2.5	3.0	339	Chronic.
11	11,000	42.0	6.0	0.0	6.0	660	Chronic and adhesions.
12	12,600	79.0	7.0	3.0	10.0	1260	Retrocecal and adhesions.

In Table I the relative formula is found to be in the majority of cases above 5 and the absolute formula above 500. In these patients the appendicular region alone was explored at operation, since the symptoms and signs did not point to any other organic disease within the abdomen. Roentgen examinations were not made. In all but one the high relative formula proved to be of definite diagnostic value.

[9] Friedman, G. A.: Weitere Erfahrungen über Polyzythemie beim chronischem uncomplizierten Duodenalgeschwuer, Arch. f. Verdauungskrankheiten, Band xix, Ergaenzungsheft, 1913.

Of the 20 cases listed in Table II, in but one (Case 13) the appendix was found to be normal on gross and microscopic examination, even though a high relative formula was found. It is also observed that out of the 19 patients in whom a diseased appendix was found roentgen signs were positive in 13. A hyperleukocytosis was noted in 5 patients, polynuclear leukocytosis in none, leukopenia in 1; of the remainder the number of white blood corpuscles per cubic centimeter of blood was normal. The relative formula was above 5 in 17 patients and the absolute formula above 500 in 14.

TABLE II.—APPENDICITIS: WHITE CELL COUNT, ROENTGEN AND OPERATIVE FINDINGS.

Case number.	White blood corpuscles.	Polynuclears, %.	Large mononuclears, %.	Transitional leukocytes, %.	Relative transitional formula.	Absolute transitional formula.	Roentgen findings.	Operative findings.
1	11,800	54.0	2.0	4.5	6.5	767	Stagnation of barium in terminal ileum	Chronic and adhesions.
2	10,000	65.0	6.0	5.5	11.5	1150	No signs	Fibrinous.
3	7,200	59.0	2.0	5.0	7.0	504	Spasticity of the colon	Constricted.
4	14,800	75.0	3.0	4.0	7.0	1036	Tender point in ileocecal region	Chronic and adhesions.
5	7,400	68.0	1.5	12.0	13.5	999	Intestinal stasis; visible appendix	Long appendix; mucosa ulcerated.
6	9,600	49.0	1.0	7.0	8.0	768	Visible appendix	Chronic and numerous adhesions.
7	11,200	63.0	4.0	2.0	6.0	672	No signs	Chronic obliterative and adhesions.
8	6,600	72.5	2.0	5.0	7.0	462	Spasticity of the colon	Chronic.
9	4,200	51.0	6.0	13.5	19.5	819	No signs	Perforated.
10	6,400	57.0	0.5	7.5	8.0	512	No signs	Fibrinous.
11	8,600	58.0	0.5	0.0	0.5	43	Tender point in ileocecal region; visible appendix	Kinked and adhesions.
12	6,400	42.0	3.0	9.0	12.0	768	No signs	Chronic.
13	5,400	57.0	4.0	4.0	8.0	432	No signs	Normal and adhesions.
14	11,600	62.5	4.0	5.5	9.5	1102	Visible appendix	Constricted.
15	6,800	45.0	6.0	9.0	15.0	1020	Visible appendix	Chronic.
16	10,400	42.5	1.5	4.0	5.5	572	Visible appendix	Kinked and adhesions.
17	7,200	37.0	0.5	0.0	0.5	36	Adhesions about appendix	Retrocecal and adhesions.
18	6,000	61.0	1.5	1.5	3.0	180	Intestinal stasis	Chronic.
19	9,900	62.0	1.0	6.0	7.0	693	No signs	Constricted and adhesions.
20	5,000	51.0	3.5	5.0	8.5	425	Visible appendix	Chronic and concretions.

In all the cases tabulated in Table III roentgen examinations were also made to help establish the diagnosis of appendicitis, and if these findings and the roentgen results of Table II are compared with the transitional group counts in both tables, it is noted that roentgen signs were positive in about 57 per cent. of the cases; transitional leukocytosis in about 87 per cent. of them.

It may be added that the transitional formula was computed in many conditions. It was found to be low in achylia gastrica, in gastrosuccorrhea, in gastric catarrh, in gastric crises of tabetics, in pernicious anemia, in 2 cases of myelogenous, in 1 case of myxedema, in 6 cases of hyperthyroidism and 3 cases of Addison's disease. A high transitional formula was occasionally found in gastric

and intestinal cancer, and in 1 case of achylia gastrica in which tenderness was elicited by the Meltzer method and marked tenderness in the appendicular region was also found on fluoroscopic examination.

TABLE III.—WHITE CELL COUNT IN APPENDICITIS, ASSOCIATED WITH OTHER CONDITIONS: ROENTGEN AND OPERATIVE FINDINGS.

Case number.	White blood corpuscles.	Polynuclears, %.	Large mononuclears, %.	Transitional leukocytes, %.	Relative transitional formula.	Absolute transitional formula.	Roentgen findings.	Operative findings.
1	6200	62	1.5	4.5	6.0	372	Adhesions about appendix	Appendix chronic and adhesions; strawberry gall-bladder and pericholecystic adhesions.
2	4400	66	0.0	2.0	2.0	88	Tender point in ileocecal region; visible appendix	Appendix buried in adhesions. Chronic cholecystitis with adhesions.
3	5200	60	4.0	7.0	11.0	572	No signs	Appendix kinked with concretions—numerous adhesions around; callous ulcer at pylorus posteriorily; thick gall-bladder with several stones.
4	4800	41	4.0	6.0	10.0	480	Tender point in ileocecal region	Appendix; chronic indurated ulcer at lesser curvature, near pylorus; adhesions between gall-bladder and pylorus.
5	6900	70	4.5	3.5	8.0	552	No signs	Appendix; mucosa inflamed and ulcerated; broad adhesions band; callous ulcer at first portion of duodenum, anteriorily.
6	7100	61	3.0	5.0	8.0	568	No signs	Appendix constricted with adhesions; callous ulcer at the first portion of duodenum anteriorily.
7	8000	50	7.0	5.0	12.0	960	No signs	Appendix adherent with inflamed mucosa; callous ulcer at first portion of duodenum with small perforation.
8	3800	59	5.0	1.0	6.0	228	No signs	Appendix constricted and adhesions; callous ulcer at first portion of duodenum anteriorily.
9	7400	50	1.0	6.0	7.0	518	Tender point in ileocecal region	Appendix chronic; broad band around colon causing intestinal obstruction; diverticulum in the colon.
10	5400	56	1.0	1.0	2.0	108	No signs	Appendix chronic; ulcer between second and third portion of duodenum.
11	9400	52	1.5	6.5	8.0	752	No signs	Appendix kinked, thickened and bound by adhesions; scar at extreme portion of pylorus.
12	4600	66	0.0	2.5	2.5	115	No signs	Long appendix; no inflammation; adhesions at mesenterium and between gall-bladder and pylorus.
13	7400	44	4.0	4.0	8.0	592	Tender point in ileocecal region and intestinal stasis	Appendix chronic and adhesions; perforated duodenal ulcer.

Abstracts of Histories of Illustrative Cases.

Case I (Case 15, Table II).—H. G., female, aged fifteen years; first seen April 6, 1918. Complained of obstinate constipation. Two weeks previously she had an attack of pain in the right lower quadrant of the abdomen. Physical examination revealed marked

tenderness in the appendicular region, which was also elicited by Meltzer's method. The appendix was visible six hours after ingestion of the contrast meal and remained visible in the twenty-

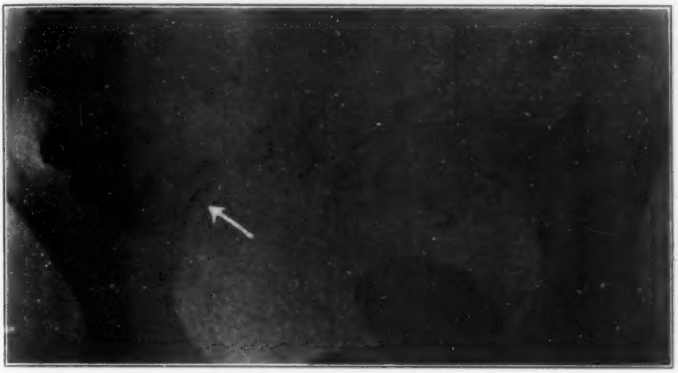


FIG. 2.—Showing barium-filled appendix twenty-four hours after ingestion of the barium meal.

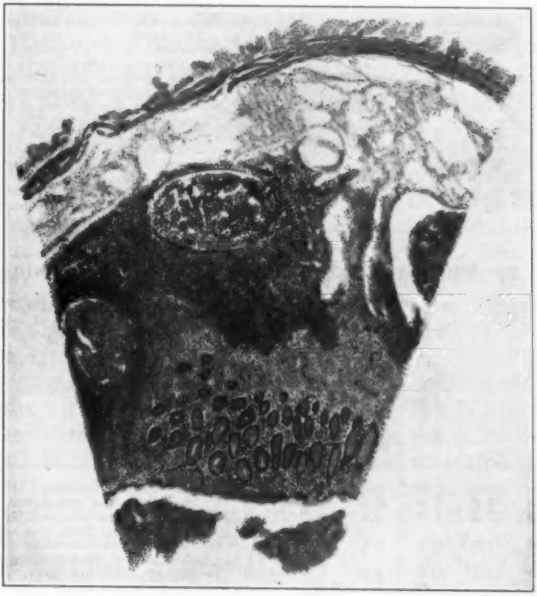


FIG. 3.—Section from the wall of the appendix showing both a moderate infiltration with eosinophile polymorphonuclear leukocytes and edema of the mucosa and submucosa.

four and forty-eight hour plates (Fig. 2). She was operated upon April 14 and a section of the appendix is illustrated in Fig. 3. The history is a typical one; the physical and roentgen signs were positive and the transitional formula high, 15.

CASE II (Case 1, Table II).—A. O., female, aged eighteen years; first seen December 28, 1915, complained for the last six years of pain in the pit of the stomach and of obstinate constipation. The pain was always immediately relieved by eating. She vomited on several occasions. On physical examination there was slight

TABLE IV.—WHITE CELL COUNT IN CHRONIC PEPTIC ULCER AND OPERATIVE FINDINGS.

Case number.	White blood corpuscles.	Polynuclears, %.	Large mononuclears, %.	Transitional leukocytes, %.	Relative transitional formula.	Absolute transitional formula.	Operative findings.
1	6,200	68.5	0.0	1.0	1.0	62	Callous ulcer at the lesser curvature.
2	7,600	68.0	0.0	1.0	1.0	75	Indurated ulcer at the pylorus with adhesions.
3	6,200	71.5	0.0	0.5	0.5	31	Callous ulcer at pylorus; appendix appeared to be normal.
4	9,400	63.0	0.0	1.0	1.0	94	Callous ulcer at lesser curvature; appendix normal.
5	12,000	76.0	1.0	0.0	1.0	120	Perforated ulcer at posterior wall of stomach.
6	6,800	63.5	0.5	1.0	1.5	102	Callous ulcer at first portion of duodenum; removed appendex, normal.
7	9,600	71.5	0.5	2.0	2.5	240	Soft ulcer at first portion of duodenum; appendix normal.
8	5,800	68.0	1.0	1.0	2.0	116	Pyloric obstruction due to large callous ulcer; appendix normal.
9	7,200	69.0	1.0	0.0	1.0	72.0	Callous ulcer at first portion of duodenum; appendix normal.
10	9,300	60.0	0.0	3.0	3.0	279	Large indurated ulcer at posterior wall of duodenum; appendix normal.

TABLE V.—WHITE CELL COUNT IN MISCELLANEOUS CONDITIONS AND OPERATIVE FINDINGS.

Case number.	White blood corpuscles.	Polynuclears, %.	Large mononuclears, %.	Transitional leukocytes, %.	Relative transitional formula.	Absolute transitional formula.	Operative findings.
1	9,200	55.0	0.0	2.0	2.0	184	Pericholecystic adhesions.
2	16,800	84.0	1.0	0.0	1.0	168	Thick gall-bladder and stones.
3	5,600	65.0	1.0	1.0	2.0	112	Hour-glass stomach caused by adhesion band extending from liver to stomach.
4	11,400	74.0	6.0	5.0	11.0	1254	Gall-stones; fistula between gall-bladder and colon; no appendectomy.
5	23,000	75.5	0.0	5.0	5.0	1150	Perforated duodenal ulcer; right-sided subphrenic abscess.
6	5,000	68.5	0.5	0.5	1.0	50	Sclerosis of the pancreas.
7	11,200	59.0	2.0	0.0	2.0	224	Gall-stones.
8	6,900	64.0	0.0	0.0	0.0	0	Gall-stones.
9	7,600	71.0	1.5	1.5	3.0	228	Stone in left kidney.
10	6,000	68.0	2.0	0.0	2.0	120	Stone in right kidney.

TABLE VI.—WHITE CELL COUNT IN PATIENTS WHOSE APPENDICES HAD BEEN PREVIOUSLY REMOVED.

Case number.	White blood corpuscles.	Polynuclears, %.	Large mononuclears, %.	Transitional leukocytes, %.	Relative transitional formula.	Present illness.
1	12,400	63.0	6.0	0.0	6.0	Perforated duodenal ulcer.
2	8,200	54.0	6.0	1.0	6.0	Floating kidney.
3	...	55.5	2.5	6.5	9.0	Postoperative adhesions around appendix.
4	5,600	66.5	3.0	5.0	8.0	Cecum mobile.
5	9,200	71.0	2.0	1.0	3.0	Postoperative adhesions and intestinal stasis.
6	12,800	60.5	4.0	6.0	10.0	General visceroptosis.
7	10,000	40.0	3.0	3.0	6.0	Ascaris lumbricoides.
8	4,000	55.0	2.0	6.0	8.0	Bleeding gastric ulcer.
9	5,400	60.0	0.0	6.0	6.0	Postoperative peri-appendicular adhesion.
10	9,400	52.0	0.0	8.0	8.0	Asthenic gastric catarrh.
11	6,100	68.0	2.5	0.0	2.5	Spastic constipation.
12	4,200	61.0	0.0	0.0	0.0	Hepatoptosis.
13	...	71.0	0.0	5.0	5.0	General itching of the body of unknown origin.
14	5,400	60.0	0.0	0.0	0.0	Postoperative adhesions.

tenderness in the epigastric region. No tenderness was elicited by palpation in the appendicular region or by Meltzer's method, and digital rectal examination was negative. There was a slight microscopic stagnation of food on a fasting stomach and a marked hyperchlorhydria after an Ewald test breakfast. The stools were positive for occult blood on three different occasions. Fluoroscopic examination and radiographic findings showed subtonic type of stomach, no tender pressure-points at curvatures of stomach or at the pyloric ring, no niche and the duodenal cap regular and well filled. There was a large gastric residue nine and a half hours after ingestion of the barium meal, and the terminal ileum was found to be slightly filled twenty-four hours later. The appendix was not visible. A diagnosis of gastric ulcer was made. The patient was put on a Lenhardz diet for two weeks. She improved and remained well under ulcus therapy until April 15, 1916, when all the symptoms recurred.

Operation, May 25, 1916, revealed chronic inflammation of the appendix with peri-appendicular adhesions. The gall-bladder and pancreas were normal and no ulcer found in the stomach or duodenum. It is quite evident that this case simulated gastric or duodenal ulcer. The diagnosis of appendicitis was not made prior to the operation because the value of the transitional leukocytosis was then underestimated.

CASE III (Case 1, Table III).—A. H., male, aged thirty-one years, was first seen September 18, 1917. For the past eleven years he suffered from indigestion and attacks of pain in the pit of the stomach, which radiated to the lower right quadrant of the abdomen; pain had no relation to food and was more intense on laughing,

coughing or sneezing. He vomited with blood at the onset of his illness. He was treated at Wegele's Sanitorium in 1913 for gastric ulcer, and the same diagnosis was made by Prof. Adolph Schmidt in Frankfurt. On examination he showed tenderness in the continuation of the right axillary, scapulary lines at the level of the gall-bladder, and marked tenderness in the appendicular region by Meltzer's and Bastedo's methods. There was no stagnation of

FIG. 4.—Section of the appendix showing complete destruction of mucosa and obliteration of lumen by a mass of fatty and fibrous tissue.

food and the acidity of the gastric contents was normal. Occult blood tests of the stools were repeatedly negative. Urine analysis, Wassermann reaction, fluoroscopic and radiographic examination of the stomach were negative. There was a stasis in the large intestines seventy-two hours after ingestion of the barium meal, and after a barium enema the transverse colon appeared to be markedly ptotic, sharply kinked at the proximal portion and adherent to the cecum. A diagnosis of pericholecystic adhesions

and chronic appendicitis was made. At operation the appendix was found buried in adhesions. A strawberry gall-bladder, with adhesions, was also removed. There was no ulcer of the stomach or duodenum and the pancreas appeared to be normal. (Fig. 4 shows section of the appendix.)

Transitional leukocytosis, tenderness elicited by Meltzer's and Bastedo's methods, roentgen signs and the tender pressure-points in the right axillary, scapulary line at the level of the gall-bladder, all added to make the diagnosis of appendicitis, and pericholecystic adhesions.[10] [11]

CASE IV (Case 4, Table III).—W. M., male, aged forty-three years, first seen October 31, 1917, was suffering for a number of years, with vomiting and sharp pain in the pit of the stomach immediately after meals. Examinations revealed tenderness in the epigastric region. The laboratory and roentgen findings pointed to an ulcer of the stomach. There were no symptoms or roentgen signs or other physical findings to lead one to suspect an associated appendicitis. At operation a large indurated ulcer was discovered at the lesser curvature near the pylorus. There were adhesions between the gall-bladder and the duodenum. The appendix was removed and found to be normal on gross examination, but microscopically scattered through the mucosa were many phagocytic cells filled with hemosiderosis pigment. The epithelium was normal, but there was some fibrous thickening of the submucous coat and occasional fibrous scarring of the muscular coats. These changes suggested a mild chronic appendicitis. The high transitional formula was the only aid for the diagnosis of appendicitis.

CASE V (Case 11, Table III).—K. G., male, aged twenty-nine years, first seen April 2, 1918, gave a history of indefinite abdominal pain appearing at intervals of several months. He had his first attack five years ago. Since then he was observed by several internists and a complete roentgen examination of the gastro-intestinal tract had been made. A definite diagnosis was not reached. However, based upon a transitional formula of 8, a positive diagnosis of appendicitis was made in spite of negative physical and roentgen signs. At operation, April 20, 1918, a kinked and thickened appendix with adhesions was found and a scar resulting from a healed ulcer at the extreme portion of the duodenum was discovered. Microscopically some fibrous thickening of the muscular coat with slight fatty replacement was observed.

CASE VI (Case 2, Table III).—F. B., female, aged thirty years; first seen September 29, 1917, complained of indigestion for many years, her condition becoming worse during the past year. Her

[10] Friedman, G. A.: Pericholecystic Adhesions Dyspepsia and its Diagnosis, New York Med. Jour., 1918, cvii, 337.

[11] Friedman, G. A.: Abstract of Discussion on Dr. Smithies's paper: Pericholecystic Adhesions, Jour. Am. Med. Assn., 1918, lxxii, 1808.

chief complaint was a sensation of pressure or load in the epigastrium. She was extremely nervous, suffered a great deal from obstinate constipation, alternating with diarrhea, and in the course of one year she lost forty pounds in weight. Various diagnoses were made, such as nervous dyspepsia, auto-intoxication and even acidosis. She appeared emaciated, her weight being eighty-eight pounds. She showed marked dermographia and had extreme tenderness in the continuation of the axillary line at the level of the gall-bladder. Tenderness was also elicited in the appendicular region on palpation by Meltzer's method and on rectal examina-

FIG. 5.—Lantern-slide reproduction of roentgenogram showing barium-filled appendix seventy-two hours after ingestion of the barium meal.

tion. There was no stagnation of food, but the free hydrochloric acid was strongly positive. The stools and urine analysis were negative except for slight traces of sugar on several occasions. Indican was always in excess. Fluoroscopic and radiographic examinations showed marked ptosis of the stomach and of the transverse colon. The appendix was visible (Fig. 5) in twenty-four-, forty-eight- and seventy-two-hour plates. A diagnosis of cholecystitis was made. Appendicitis was not entertained because of the low transitional formula (2), although there were intestinal stasis and a visible appendix. At operation, October 19, 1917, adhesions between the gall-bladder, duodenum and pylorus were

found. The gall-bladder was atrophic. Cholecystectomy was performed. Adhesions were noticed around the appendix, which was removed. On microscopic examination, however, the appendix was normal.

This case illustrates that physical and roentgen signs may be present without an actually diseased appendix, but the low transitional formula helped, indeed, to rule out appendicitis.

SUMMARY. 1. Transitional leukocytosis or an increase in large mononuclears and in transitional leukocytes, or an increase in either of them, was found in the blood of 87 per cent. of patients in whom evidence of chronic appendicitis was obtained.

2. There was no transitional leukocytosis in the blood of patients in whom evidence of chronic peptic ulcer was obtained or in the blood of those in whom cholecystitis, renal stones or other organic abdominal conditions were found at operation.

3. A transitional leukocytosis was found in patients in whom appendicitis was present, with other organic abdominal conditions.

4. A hyperleukocytosis and a polynuclear leukocytosis are not as frequently found in chronic appendicitis as a transitional leukocytosis.

5. A transitional leukocytosis as a diagnostic aid is superior to such roentgen signs which are supposed directly or indirectly to point to a diseased appendix.

6. Transitional leukocytosis often persists in the blood after an appendectomy is performed.

CASE OF MEDIASTINAL HODGKIN'S GRANULOMA, WITH PERFORATION OF THE CHEST WALL.

BY M. W. LYON, JR., M.D.,
SOUTH BEND, INDIANA.

(From the Laboratory Service, Walter Reed General Hospital.)

THE case of Hodgkin's granuloma here described is chiefly of interest because of the mediastinal location and large size of the mass of new tissue and its pressure erosion through the anterior chest wall. Similar cases are not unknown and have been described before, but they are comparatively infrequent. Some of the sarcomas of the thymus that have been described are perhaps cases having an association of cells resembling those of Hodgkin's disease. Ewing[1] has described three cases of thymic tumors, calling them thymomas, and has reviewed the literature of the subject.

[1] Surg., Gynec. and Obst., April, 1916, xxii, 461–472.

Two of his cases are mentioned as partaking of the nature of Hodgkin's granuloma.[2] While admitting the possible, if not probable, thymic origin of this new growth of tissue, it seems more logical to refer to it as a Hodgkin's granuloma rather than a thymoma or sarcoma, since the neoplastic mass is of that general type of tissue characteristic of Hodgkin's disease. None of the sections that have been examined reveal tissue identifiable as thymic. There is a certain lack of agreement by authors as to the nature of Hodgkin's disease. Mallory,[3] for example, refers to it as lymphosarcoma. Most authors consider it a well-characterized disease of the lymph nodes, probably of infectious origin. MacCallum[4] and Ewing[5] regard it as such and give careful descriptions of the lesions with references to the important papers. Aside from the unusual location of this growth and the absence of involvement of the cervical nodes, this case appears rather characteristic of Hodgkin's granuloma.

Clinical History. This case was not seen by me during life, and the following clinical history is compiled from the various records on file in the hospital. They represent observations of various clinicians during the long stay of the patient.

Family and Personal History. Age, twenty years. Previous occupation, railroad fireman. Tropical service, none. Denies use of alcohol. Five brothers, living and well; mother, living and well; father, probably living and well. Denies venereal infection.

History of Present Disease and Subjective Symptoms. In April, 1917, he stumbled over a trunk and struck his chest on a cot; there resulted swelling and soreness for several days, but no abrasion. The patient was not certain that the swelling ever disappeared, but noticed about a month later that there was a swelling at the site of the injury or perhaps a little higher. This increased in size; enlargement was not painful. At this time the patient noticed shortness of breath on exertion and at drill. Patient was relieved from active duty and placed on recruiting service, owing to impaired physical condition. The patient was finally sent to this hospital, October 31, 1917. His general condition was good except for a growth in the chest, the growth being about two and a half inches above and to the inner side of the right nipple. The bloodvessels in and around the area were prominent and enlarged. On November 2, a roentgen-ray examination showed a mass in the right chest and mediastinum, probably sarcoma. November 9 a double-plus blood-Wassermann reaction was reported by the Army Medical School and antisyphilitic treatment insti-

[2] The present case has been seen by Dr. Ewing and he has pronounced it as another example of thymoma belonging to the Hodgkin class.

[3] The Principles of Pathological Histology, 1914, p. 326.

[4] A Text-book of Pathology, 1917, p. 791.

[5] Neoplastic Diseases, 1919, pp. 352 and 895.

FIG. 1.—Perforation of chest wall by growth.

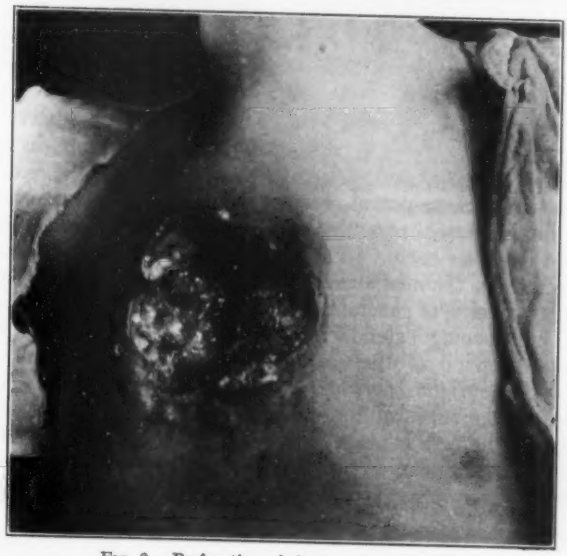


FIG. 2.—Perforation of chest wall by growth.

tuted. Two other positive reports were obtained. Antiluetic treatment had no effect and was abandoned. Roentgen-ray treatment was tried, but without lessening the growth. About the middle of April, 1918, the chest wall became perforated (Figs. 1 and 2). The exposed tissues became infected and underwent necrosis and sloughing. The chest opening was very foul and the edges of the wound inflamed until dichloramin-T in chlorcosane was used, after which treatment the necrotic condition disappeared and more or less healthy granulations formed, so that the edges of the opening into the chest then appeared healthy. About the last week of June there was a sudden discharge of pus from the chest, and from that time there continued considerable purulent discharge. The patient was bedridden for months, but sat up in a wheel-chair at times. Death from toxemic exhaustion, August 15, 1918.

Objective Symptoms. Normal weight 145 pounds and on admission 135 pounds, weight progressively diminishing. Heart rapid, irregular, was displaced downward and to the left. Respiration difficult.

	Pulse.	Respiration.	Temperature.
Nov., 1917	74 to 120, usually about 100	20 to 30, usually about 20	98° to 103.8°
Dec., 1917	80 to 126, " 110	20 to 36, " 24	97° to 102.0°
Jan., 1918	60 to 124, " 100	20 to 32, " 22	99° to 101.8°
Feb., 1918	90 to 124, 90 to 100	20 to 24, " 20	98° to 103.4°

Laboratory Findings. December 22, 1917, roentgen ray showed a large tumor in the right mediastinum, referred to as a sarcoma (Fig. 3). Urine: traces of albumin and a few leukocytes. Blood: red blood cells, about 4,000,000; hemoglobin, 75 to 80 per cent.; white blood cells, 13,000 to 33,000; differential count: small mononuclears, 3; transitionals, 1 to 3; eosinophiles, 0 to 2; neutrophiles, 82 to 84; basophiles, 0 to 1. No laboratory examinations made since December, 1917.

Autopsy Report, Including Microscopic Examination of Tissue. *Body.* A young adult, white male, 1660 mm. in length; body warm; rigor mortis, absent; livor mortis, absent. Skin, very pale. General emaciation, very marked. There are several bedsores in the gluteal region. Hair, brown. Irides, blue; pupils, 7 mm. in diameter each. In the upper part of the chest, somewhat to the right of the median and including the median line, is a large irregular opening of general oval shape, 130 x 100 mm. (Figs. 1 and 2). This opening extends into the right chest cavity. A considerable portion of the sternum and adjacent portions of the ribs and the right clavicle have been eroded away. The skin surface of the edges of the opening in the chest is covered with normal epidermis, beneath which is what appears to be newformed fibrous tissue, having the general appearance of a recently healed wound. The pleural surface of the edges of the opening

appears to be composed of infected and necrotic tissue. The exposed ends of bones are eroded and necrotic. The color at the base of the opening in the chest varies from pink to greenish gray. The manner of formation of the chest opening appears to have been primarily from pressure necrosis, and the continued enlargement appears to have occurred in part at least by necrosis of the skin and subjacent tissue immediately behind the edges of the opening (Figs. 1 and 2, lower and right hand, with reference to the patient, margin), making secondary openings, the intervening bridges of tissue between these and the large chest opening subsequently necrosing away.

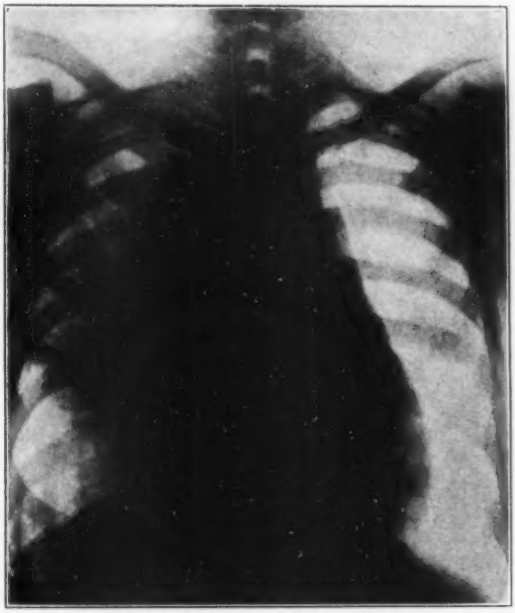


FIG. 3.—Roentgen-ray picture of growth in chest. Made by Major J. H. Selby, M. C., U.S.A.

Thorax. The sternum and costal cartilages were removed without difficulty and were not adherent to the subjacent tissues. Diaphragm at the fifth interspace on each side.

In the left pleural cavity are a number of old fibrous adhesions; no excess of fluid. In the right pleural cavity are many old fibrous adhesions and a large amount of purulent material. The opening in the chest wall leads into this cavity. This purulent material is to a considerable extent pocketed between the lobes of the lung and between the lung and the posterior chest wall. This posterior

pocket penetrates the posterior pleural lining and extends down through the soft tissue behind the peritoneum into the region lying alongside of the lumbar spine as far as the sacroiliac joint and is filled with thick yellow pus. Transverse processes of the lumbar vertebræ and parts of the lower ribs are in this pus cavity, and these bony structures are more or less eroded and roughened; 970 c.c. of pus in the pleural cavity and about 650 c.c. in the retroperitoneal abscess. Cultures from this pus yielded Staphylococcus pyogenes.

FIG. 4.—New growth surrounding trachea and bronchus, invading and compressing lung.

The pericardium contains a slight excess of clear serous fluid. Aside from an occasional small nodule (3 mm.) at the anterior inferior border the pericardium is essentially uninvolved. Its anterior aspect is not covered with any of the new growth. In the location of the thymus are several large irregular nodular masses,

the lowest of these just over the base of the heart and 20 to 50 mm. in diameter.

The mediastinum is occupied by a large mass of new tissue which extends into the right pleural cavity. This mass of tissue roughly measures 150 mm. in length by 75 mm. in width and thickness. It invades and compresses the lung tissue on the right side, so that only about half the normal amount is present. What there is of the lung appears necrotic and atelectatic. This large, hard, yellowish-gray mass extends firmly around the trachea and bronchi (Fig. 4) and invades the neighboring lymph nodes, which are enormously enlarged, firm and hard. On section these enlarged nodes present a light yellowish-gray color and the larger ones often have rather extensive soft necrotic centers. These nodes vary in size from about 5 mm. in the posterior mediastinum to the very large mass of new tissue in the anterior part of the chest.

Cervical and axillary lymph nodes are not enlarged.

Abdomen. Abdominal fat is essentially lacking. There is 580 c.c. of slightly turbid fluid in the peritoneal cavity, but the serous surfaces appear normal.

Many of the abdominal lymph nodes are enlarged and hard, resembling those of the thorax. Noteworthy among the glands so affected are the superior gastric nodes, hepatic nodes and pancreaticosplenic nodes.

From the posterior attachment of diaphragm downward the retroperitoneal nodes, including the iliac nodes, form a more or less fused, solid, irregular mass. The individual masses of new growth vary in size from 10 to 100 mm. in their greatest diameters. The inguinal nodes are also involved in this process, some of them having a diameter of 30 to 50 mm. Enlarged nodes can also be palpated along the inner aspect of the right thigh as far down as the knee.

Microscopic examination of the lymph nodes of the size of about 10 mm. in longest diameter shows them to be composed of an indefinite mixture of young fibrous tissue, small mononuclear cells, with deep staining nuclei, larger cells, with rather oval vesicular pale staining nuclei, a small number of eosinophiles and cells of very large size as compared with any of the others, containing a single large rounded or lobed nucleus or two or more nuclei. The cytoplasm of these large cells is ill-defined; their nuclei are pale staining, but with a dark staining, sharply defined outline and irregularly distributed, dark staining, chromatic streaks and spots within (Fig. 5 and 6). The original lymphoid tissue has been entirely replaced by tissue composed of the above association of cells. The larger, enormously swollen lymph nodes, measuring several centimeters in diameter, show large areas of the above association of cells, with areas of marked fibrous-tissue formation. In the bronchial lymph nodes some anthracotic pigment may be seen in

these fibrous portions. Necrosis of the tissue is seen in the central portion of many of the larger nodes.

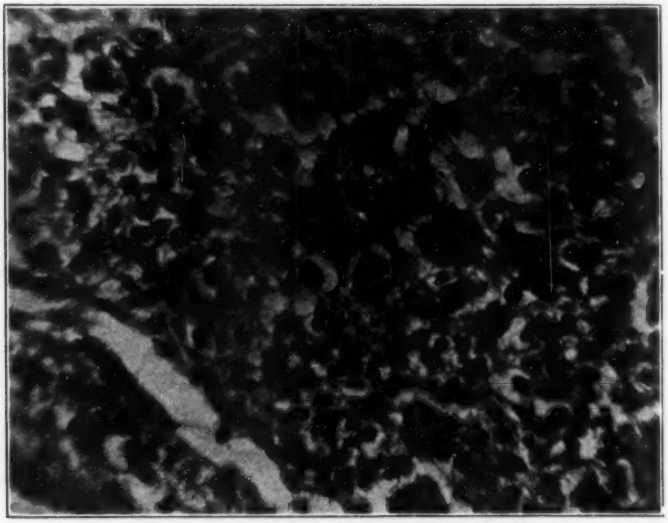


FIG. 5.—High power. Reed giant cells, fibroblasts, lymphocytes.

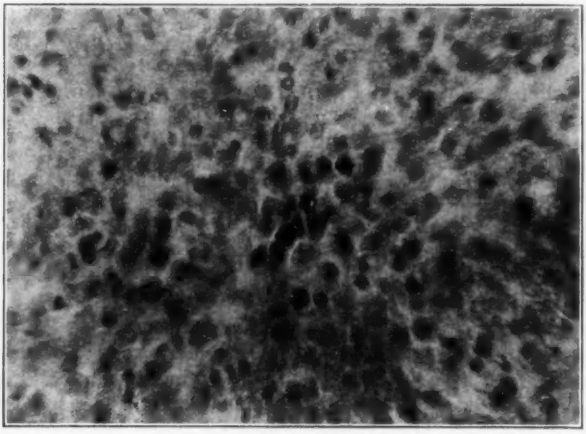


FIG. 6.—High power. A group of small cells, about a third of them are eosinophiles.

Heart. The heart is small, its musculature soft and flabby; leaflets and cusps of all the valves appear normal. The aorta appears small. On the surface of the heart, particularly along

the courses of the coronary vessels, are found a few very small nodules usually about 1 or 2 mm. in diameter, hard and of a yellowish-gray color. The largest of these nodules measures about 5 mm. in diameter. They appear to be metastatic growths along the lymphatics of the epicardium.

Microscopic examination shows no special pathology of the myocardium. The metastatic growths seen on the surface are accumulations of small round lymphoid cells, endothelioid cells and a few fibroblasts. Only very rarely may be found a mononuclear giant cell. No eosinophiles are seen. In some places the lymphoid cells may be seen pushing in between the fibers of the myocardium just beneath the epicardium (Fig. 7). The rarity of the mononuclear giant cells in the tissue is perhaps accounted for by the fact that the nodules are small and newly formed.

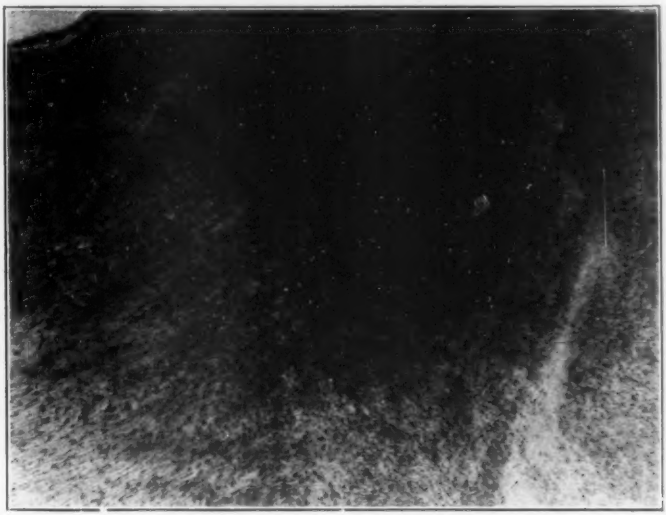


FIG. 7.—Low power. Nodule invading heart muscle.

Lungs. About one-half of the right lung anteriorly and medially is replaced, or at least its position is occupied, by a great bulk of tissue having the characteristics of Hodgkin's granuloma, as already described under the thoracic lymph nodes. The posterior half of the lung is dark, meaty red in color and appears atelectatic and necrotic.

The left lung feels everywhere soft and crepitant and shows a considerable degree of anthracosis.

Microscopic examination of the right lung (Fig. 8), where the tumor-like masses are pressing on it, shows the alveoli to be elon-

these fibrous portions. Necrosis of the tissue is seen in the central portion of many of the larger nodes.

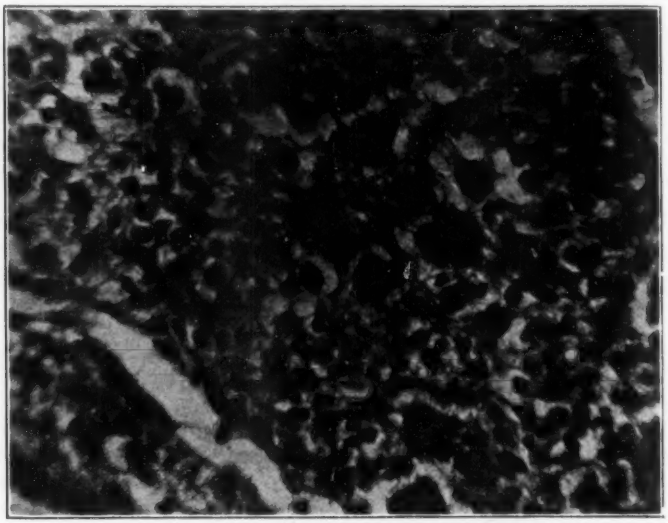


FIG. 5.—High power. Reed giant cells, fibroblasts, lymphocytes.

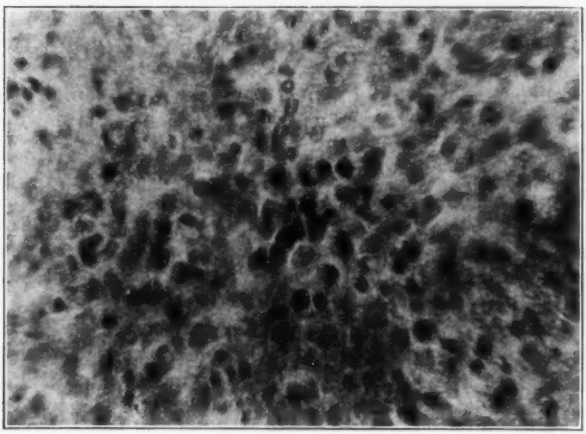


FIG. 6.—High power. A group of small cells, about a third of them are eosinophiles.

Heart. The heart is small, its musculature soft and flabby; leaflets and cusps of all the valves appear normal. The aorta appears small. On the surface of the heart, particularly along

the courses of the coronary vessels, are found a few very small nodules usually about 1 or 2 mm. in diameter, hard and of a yellowish-gray color. The largest of these nodules measures about 5 mm. in diameter. They appear to be metastatic growths along the lymphatics of the epicardium.

Microscopic examination shows no special pathology of the myocardium. The metastatic growths seen on the surface are accumulations of small round lymphoid cells, endothelioid cells and a few fibroblasts. Only very rarely may be found a mononuclear giant cell. No eosinophiles are seen. In some places the lymphoid cells may be seen pushing in between the fibers of the myocardium just beneath the epicardium (Fig. 7). The rarity of the mononuclear giant cells in the tissue is perhaps accounted for by the fact that the nodules are small and newly formed.

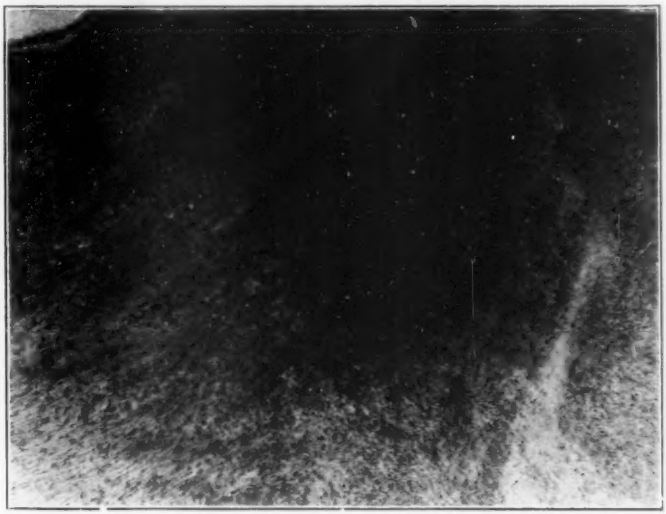


FIG. 7.—Low power. Nodule invading heart muscle.

Lungs. About one-half of the right lung anteriorly and medially is replaced, or at least its position is occupied, by a great bulk of tissue having the characteristics of Hodgkin's granuloma, as already described under the thoracic lymph nodes. The posterior half of the lung is dark, meaty red in color and appears atelectatic and necrotic.

The left lung feels everywhere soft and crepitant and shows a considerable degree of anthracosis.

Microscopic examination of the right lung (Fig. 8), where the tumor-like masses are pressing on it, shows the alveoli to be elon-

gated and flattened and much compressed, due to the pushing inward on them of the rounded growing mass. The lung tissue is not only compressed by the growth but is infiltrated and replaced by it. The growth follows, for the most part, the bronchi and bronchioles. The earliest manifestation appears to be an increase of connective tissue about the vessels and bronchioles, with the presence of many small mononuclear cells and some cells with larger, rather vesicular nuclei. The characteristic giant cells are not found in these apparently early lesions, and eosinophiles are equally lacking. Usually, in the invaded parts of the lung, it is with difficulty that remains of lung tissue can be seen in the mass. The most persistent structure is the bronchiole. Often one of these is

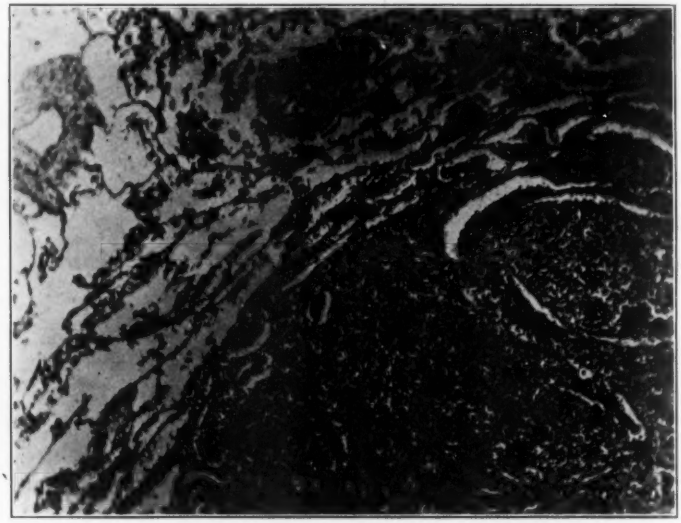


FIG. 8.—Low power. Edge of small nodule in lung.

seen with a fairly well formed lumen lined with characteristic columnar cells, surrounded on all sides by dense masses of the new invading cells, with no evidence of lung parenchyma near it. In some sections, embedded in the mass of new tissue complex, are ill-defined spaces compressed and lined with cuboidal cells. On studying the edges of the tissue invading the lung there appear to be remains of walls of alveoli the epithelium of which is no longer flattened. Examination of the edges of such places indicates that the new growth can follow along the walls of the alveoli as well as along the paths of the bronchi and bronchioles. Rather seldom may be seen in the lung tissue proper, unassociated with bronchioles or bloodvessels, small nodules (about 1 mm. or less)

of the new invading cells, typical of Hodgkin's granuloma in all respects except that the eosinophiles are lacking or at least very inconspicuous. The unattacked parts of the lung show nothing of special interest. The air vesicles may be somewhat dilated or in other places compressed. The capillaries do not appear engorged. Usually desquamated epithelial cells are present in the alveoli, often in rather large numbers. Red blood cells are frequently found in the alveoli as well.

FIG. 9.—Section of spleen showing nodules of new tissues.

Spleen. The spleen, 120 x 70 x 45 mm., has the usual slaty purple color. Showing through the dark color of the organ are seen, here and there, yellowish nodules. On section the bulk of splenic pulp is of an essentially normal dark reddish-brown color. In it are seen many yellowish nodules varying in diameter from 1 to 15 mm. They are much more numerous on section of the organ than would be suspected from external examination (Fig. 9). Roughly, these yellowish masses appear to make nearly half the bulk of the organ. Microscopically, in the parts of the organ not invaded by the growth, the splenic tissue shows no noteworthy changes. The splenic venules are very distinct and usually well filled with blood. There are places in the pulp in which are many red cells. There is no sharp line of demarcation between the splenic tissue and the tissue characteristic of Hodgkin's disease.

Some of the larger nodules have undergone necrosis and essentially none of the characteristic cells are present in it. One section shows a small beginning nodule in the adventitia of one of the arterioles.

Liver. The liver presents a normal reddish-brown color. On section it cuts with about normal firmness and presents a normal brownish color in which the bloodvessels are moderately conspicuous. No metastatic growths are seen on its surface or in any of several sections made through the organ. Microscopic examination shows the liver cells granular and with well-staining nuclei. The sinusoids of the periphery of most of the lobules are rather well filled with blood and the liver cells correspondingly compressed.

The gall-bladder contains about 10 c.c. clear golden-yellow bile; its ducts are patent; no stones are present.

Pancreas.—The pancreas appears normal, with the exception of a terminal portion of the tail. In this end, for nearly one-third or quarter of the organ, are found hard, oval nodules ranging in size from less than 1 mm. up to those which measure about 15 mm. in the longest diameter. On section these masses resemble those found in the various lymph nodes. Microscopically the pancreatic tissue appears essentially normal except at the left extremity. Here the nodular masses noted macroscopically show the same association of cells as found in the mediastinal lymph tissue. Some show areas of central necrosis. Eosinophiles are very rarely seen in this invading tissue. There does not appear to be much of an infiltration of the pancreatic parenchyma by the new growth, but it seems to stimulate a marked proliferation of the interlobular connective tissue. Small beginning nodules are found in the thickened interlobular tissue (Fig. 10).

Alimentary Canal. The alimentary canal shows no abnormalities visible externally; its various portions were unopened.

Kidneys. The left kidney measures 120 x 55 x 35 mm. On section it presents a very pale appearance, with a cortex about 7 mm. in thickness. The bloodvessels are well defined in it. Capsule strips readily leaving a smooth surface in which the stellate veins are rather conspicuous. In the interior of the organ is a yellowish nodule with a diameter of 5 or 6 mm. The right kidney is essentially like the left, but contains no nodules.

Microscopic examination shows no striking pathology of the kidneys except for the metastatic nodule just referred to. The tubular epithelium is granular and flattened; tubules appear dilated and are usually filled with some loose reticular or granular matter. Their nuclei stain well. The glomeruli are usually somewhat shrunken; occasionally their capillaries are distended and sometimes there is granular matter in the space between the tuft and the capsule. The nodule referred to macroscopically is composed of an association of cells characteristic of Hodgkin's granuloma,

with the exception of the eosinophiles. The growth has followed the interstitial connective tissue gradually crowding out the renal parenchyma. But in the nodule may be clearly seen remains

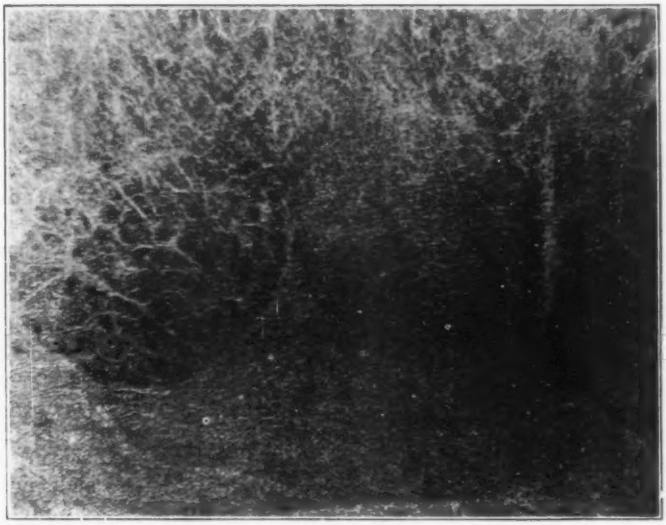


FIG. 10.—Low power. Nodule invading pancreatic tissue.

FIG. 11.—Low power. Edge of small nodule in kidney.

of tubules with well-preserved epithelial cells. Less frequently a glomerulus is seen caught in the nodule. The lumina of the included tubules, which are not very frequent, may be empty, or more or less filled by granular, hyaline material, or sometimes cells probably derived from the epithelium. At the periphery of the nodule the kidney substance is seen to be distinctly pressed upon and the nodule has a well-defined edge (Fig. 11). Microscopic examination of the right kidney shows essentially the same characteristics as seen in the left except for absence of metastatic nodule.

Other Organs. The *testicles* show no abnormality.

The *bladder* appears normal in all respects.

The *prostate* gland measures 20 mm. anteroposteriorly and 20 mm. laterolaterally.

SUMMARY. A case of neoplastic growth having the tissue characteristics of Hodgkin's granuloma situated primarily in the mediastinum is described. It occurred in a young adult white male of good previous and family histories. Its duration was sixteen months. The neoplastic mass caused pressure erosion of the chest wall; the right pleura became infected and a retropleural and retroperitoneal abscess developed, the patient dying of toxemia and exhaustion. The chief pathological findings were extension of the mediastinal neoplastic growth into the right lung, involvement of the bronchial and mediastinal lymph nodes, of many abdominal lymph nodes and of the retroperitoneal and inguinal nodes. Metastatic-like growths were found in the unenlarged spleen, in the tail of the pancreas, in the right kidney and in the epicardium and beginning to invade the myocardium. The liver and the cervical, maxillary and axillary lymph nodes were uninvolved.

FIELD OBSERVATIONS ON BLOOD-VOLUME IN WOUND HEMORRHAGE AND SHOCK.[1]

BY ROGER I. LEE, M.D., LATELY LIEUT.-COL. M.C.,
CAMBRIDGE, MASS.

THE value of transfusion and infusion in hemorrhage, which had already been established before the war, received abundance of confirmation during the war. Nevertheless, during most of the war little progress was made beyond the outstanding fact that either transfusion or infusion was a life-saving procedure in certain cases. In other cases neither of these procedures seemed to be of particular benefit. There grew up the advocates of transfusion

[1] Read at the meeting of the American Climatological and Clinical Association, June, 1919.

on one hand and of the infusion of blood substitutes on the other. In each instance conclusions were drawn from clinical results.

It was obviously desirable to establish criteria; in the first place to determine the therapeutic application of either or both of these procedures, and in the second case, in order to evaluate properly these methods. While there may be many other factors involved in the transfer of blood or of blood substitutes to the patient, there are two fundamental considerations which must be granted. It must be obvious that by transfusion one transfers a certain volume of fluid, and one also transfers a certain amount of oxygen-carrying substance. By infusion one merely increases the blood volume of the patient.

Robertson and Bock,[2] utilizing the method of Keith, Rowntree and Geraghty,[3] studied the blood-volume in certain cases of wound hemorrhage. They found that with the estimation of the blood-volume and of the total hemoglobin one was able to construct rather more definitely than had been done before indications for the use of transfusion or infusion, or both. The method which they used was obviously not entirely suitable for work under the usual conditions in the field. It is apparent that if one estimates any of the ordinary constituents of the blood and then dilutes the blood with a known amount of fluid which does not contain that constituent, it is possible to derive a formula by which, more or less roughly, the blood-volume can be calculated. After consideration of the various possible methods it seemed most feasible to utilize hemoglobin determination. In the first place it was necessary to estimate the hemoglobin by some reasonably accurate method in order to acquire part of the necessary data. In the second place it was felt that the hemoglobin determination could be made quickly, with very little apparatus and fairly accurately. The method of determining the hemoglobin was what might be called a home-made modification of Sahli's method. Using the well-known principle of that method, a goodly number of hemoglobinometers could be constructed anywhere if one had small test-tubes and decinormal hydrochloric acid. Arbitrarily an assumed normal blood, or better, pooled normal bloods were taken as standard, 100 per cent. Previous experience had indicated that this method was fairly satisfactory, and that when read in the daylight different observers constantly read within two points. Furthermore, since the comparative readings were in general made within a few moments and with the same apparatus the general errors were minimized. The actual procedure was as follows: The hemoglobin was estimated from the ear or preferably from the arm vein, then 500 c.c. or other

[2] Memorandum on Blood Volume after Hemorrhage. Reports of the Special Investigation Committee on Surgical Shock and Allied Conditions, British Medical Research Committee and Jour. Exp. Med., 1919, xxix, 139 and 155.

[3] Arch. Int. Med.. 1915, xvi, 547.

fixed amounts of either normal saline or of gum acacia in normal saline were given intravenously. As soon as possible after the infusion the hemoglobin was again estimated in the same way as before. From these estimations one then deduced the blood-volume. For example: A patient's hemoglobin was 80 per cent. before the introduction of 500 c.c. caused a 10 per cent. drop. Therefore, 10 : 80 : : 500 : x or the blood-volume, which is 4000 c.c. after the infusion or 3500 c.c. before the infusion. It was necessary to assume that the normal blood volume ranged between 5000 and 6000 c.c., depending upon the size of the individual. One compared the blood-volume actually obtained with the presumed normal for that individual. From this one also estimated the absolute hemoglobin in terms of percentage. From these data it was possible to determine in the first instance if the patient needed any increase in blood-volume, and, furthermore, if he needed any increase in the oxygen-carrying constituent.

The observations upon which this paper is based were made in field hospitals and evacuation hospitals in the A. E. F. Most of these hospitals had wards designated as "shock wards," to which patients in so-called shock were sent. In practice it worked out that most of the very seriously wounded cases were sent to this ward. The presenting problem was to get the patient in shape for transportation or for operation. Naturally, some of the cases were post-operative. Most of the patients were studied within twenty-four hours of injury. Owing to the conditions it was never possible to keep patients more than a few days for continued observation.

In all cases careful and repeated blood-pressure readings were made and in general the blood-pressure reading was taken to represent the condition of the patient with full regard for all of the varying factors, hemorrhage, shock and infection. In this work no attempt was made to study the important factor of blood-flow. The importance of blood-flow was, of course, recognized, irrespective of the question of how much blood-flow depends upon blood-volume.

In general it was found that in order to furnish a reasonable basis for recovery, patients should have at least 65 per cent. of their blood-volume and at least 25 per cent. of their total hemoglobin. Owing to the nature of this work it was obviously impossible to check up very definitely exactly at what point of either blood-volume or total hemoglobin the positive indications for transfusion or infusion came. It is evident that each case created a special problem because no two cases were alike. In some cases there was a great increase in the element of infection; in others there was the necessity of providing against an operation of more or less severity, which certainly would augment the element of shock, Furthermore, the element of shock was always a variable and undeterminable factor. It was the experience early in the work that hemorrhage

and shock were very closely associated and accumulated experience was unable to separate clearly in my mind the manifestations which could be attributed to shock. Consequently it was our custom in field and evacuation hospitals to regard wounded cases in a serious condition as suffering from hemorrhage and shock. In the paper I have continued this somewhat reprehensible practice. So far as I know we studied no cases of shock without hemorrhage.

Our results show that seriously wounded men, even without the history of hemorrhage, usually had lost a considerable amount of blood and blood-volume. Theoretically, at least, the percentage of total hemoglobin when subtracted from 100 gives the percentage of blood loss. For example, a man presents a blood-volume of 4500 c.c. against his estimated normal of 6000 c.c., or 75 per cent. His relative hemoglobin is 80 per cent. His actual total hemoglobin is 60 per cent. Presumably he has lost 40 per cent. of his blood or 2400 c.c. However, he has replaced by fluid either from his tissues or his fluid intake or both 900 c.c., as his blood-volume deficiency is only 1500 c.c. We assume that it is the 900 c.c. of fluid addition to his depleted blood-volume which has diluted his hemoglobin from 100 to 80 per cent. Of course, this argument presupposed that the man originally had both a normal blood-volume and normal hemoglobin. In general the evidence indicates that these presuppositions are reasonably sound.

In some instances these losses represented well over half the total amount of blood. In those cases we early came to recognize a very important fact. If the blood-volume was not being restored at least to an appreciable extent the prognosis was very grave, irrespective of treatment. In other words, when natural forces tended to restore in its normal fashion the blood-volume the prognosis was relatively good. We came to recognize the fact that, contrary to the usual off-hand snap judgment, but strictly in accord with logical reasoning, if a patient presented himself at the end of twenty four hours or more with a relatively low hemoglobin, say of 60 to 80 per cent., that patient was in much better condition than one who presented himself with a hemoglobin of over 100 per cent., or the well-known phenomenon of blood concentration in shock. In the most severe cases we found an astonishingly low blood-volume, sometimes under 30 per cent. of normal and an absolute hemoglobin of under 20 per cent. It may be repeated parenthetically here that in such cases the relative hemoglobin might be normal. Such cases in our experience, unless due to very recent large hemorrhage, and unless immediately corrected by large transfusions, were fatal. It became clear that, as had been observed clinically, there was a considerable group of cases of hemorrhage and shock in which, on account of the severity of the condition, little could be expected of any remedial measures. Another not inconsiderable group was

made up of those cases who had no tremendous blood-loss but who had a blood-volume ranging around 60 per cent. In those cases the execution of the obvious indication of partially restoring the blood-volume by infusion was followed by elevation of the blood-pressure and of the apparent restoration of the patient to a condition of relative well-being.

Perhaps the most interesting group of patients was the intermediate group between the two above groups. In this group the indication was for both the restoration of blood-volume and of the oxygen-carrying constituent. In some of these cases simple transfusion was enough. Other cases required both transfusion and infusion. In some cases within a relatively short time over 1000 c.c. of blood and in addition over 1000 c.c. of fluid were administered.

Inasmuch as Robertson and Bock had previously suggested that fluids administered by the alimentary canal were taken up and retained, provided the concentration of hemoglobin was adequate, fluids were administered both by mouth and by rectum whenever possible. Furthermore, although it was fully appreciated that salt solution under the skin was, like salt solution into the veins, only temporarily held in the circulation, nevertheless both of these methods were utilized to meet the temporary emergency.

It is worthy of repetition that the continued administration of fluids in goodly amounts (usually by mouth) is necessary in practically all cases requiring transfusion. Transfusion may put them by the danger-point in regard to both blood-volume and oxygen-carrying constituent, but there remains, as a rule, a considerable blood-volume deficit which it is desirable to make up as rapidly as possible. All of the cases were controlled, as far as possible, in regard to the progress of the maintenance of an adequate blood-volume by repeated hemoglobin estimations. It must be obvious that a blood which is steadily diluting, that is with a steadily falling hemoglobin reading, is steadily increasing its blood-volume.

In the connection of prognosis, which may have some possible relation to the factor of shock, a considerable series of cases seemed to demonstrate the following hypothesis: In case the blood-volume as determined by these rough methods was maintained in a satisfactory level the prognosis tended generally to be good. However, in those cases in which the blood-volume could not be maintained, and despite all methods of fluid administration, the blood tended to reconcentrate the prognosis was bad. Cases were observed in which the tendency of reconcentration was persistent despite therapy, and in which a grave prognosis could be given on account of this tendency to reconcentration even while the blood-pressure was at a satisfactory level.

Simple observation of these patients showed that, as a rule, they had a loose skin, which in itself tended to be dry, although the

surface of the skin might be covered with perspiration. It seems logical to assume that the relatively unknown factor of tissue fluids plays a considerable part in the restoration of blood-volume and that the tissue fluids are presumably called upon and relatively exhausted fairly early in this condition. This assumption and the evidence gathered in the study of blood-volume indicates that it may be highly desirable to encourage the ingestion of fluid in all cases liable to alteration in blood-volume. It is, of course, well known that soldiers in actual conflict not only lose a great deal of fluid by perspiration, etc., but also that they have frequently a diminished fluid intake for a considerable period before their injuries. Furthermore, actual experience shows that in the interval between injury and the arrival in a field hospital there is often not only loss of blood but also loss of fluid by perspiration and a continuation of the inadequate intake of fluid. In dealing with deficiencies in blood volume it must be remembered that such deficiencies irrespective of tissue fluids, which may be regarded as a reserve, may amount to 3000 c.c. The administration of sips of water during the transportation of the patient is, of course, inadequate. In one sector it was possible to adopt a system of liberal administration of fluids at several stopping-places during the period of transportation. Observations on patients from that sector, while obviously susceptible to misinterpretation, nevertheless seemed to show definitely less tendency to the severe condition of associated wound-shock and hemorrhage and the hemoglobin estimation showed fairly constantly a satisfactory and favorable hemoglobin dilution. It is believed that the recognition of the importance of the disturbance of blood-volume in the creation of the associated symptom-complex of wound hemorrhage and shock will lead to important preventive measures, such as the insistence on a liberal intake of fluid by all methods during the times of the possible acquisition of wounds and immediately after wounds. Furthermore, in the treatment of all cases of war wounds insistence ought to be laid upon the liberal intake of fluids. Since Robertson and Bock have found in their cases studied, often several days or several weeks after wounds, that the blood-volume was frequently lowered, the insistence upon the liberal intake of fluid should be continued throughout convalescence. It is also common knowledge that external warmth is beneficial to cases of exhaustion, prostration and shock. It would seem to be of great importance, in view of these studies, to avoid very carefully any considerable amount of sweating in the application of external heat in order not to run the risk of reducing further the blood-volume. Experience shows that this consideration is often overlooked.

SUMMARY. The observations reported here would seem to indicate the importance of blood-volume in wound hemorrhage and shock. Profound disturbances of blood-volume are always serious,

and if maintained for any considerable period are usually associated with death. It seems evident that the human mechanism can tolerate greater changes in the oxygen-carrying constituent—that is, the hemoglobin—than in the blood-volume. This coincides with the well-known clinical observation that the result of hemorrhage results at first in a lowered hemoglobin, or, in other words, that the blood-volume is restored at the expense of dilution of the hemoglobin. Blood-volume can be easily and roughly estimated by comparative readings of the hemoglobin percentage before and after the intravenous infusion of a known amount of fluid. A knowledge of the blood-volume gives adequate data for the establishment of rational therapy.

The milder cases of wound hemorrhage and shock require only an increase in blood-volume. The severer cases require both an increase in blood-volume and an increase in oxygen-carrying constituent. This double requirement is met in part by transfusion. However, when transfusion is indicated it is usually desirable still further to increase the blood-volume, which may be accomplished in various ways.

The continued observations on blood-volume give, furthermore, valuable information as to prognosis.

A general study of blood-volume strongly suggests certain procedures which may be utilized for the prevention and control of the associated symptom-complex known as wound hemorrhage and shock.

There is reason to believe that the general observations have an application beyond the special field in which they were made. That the blood-volume may be seriously disturbed with its attendant indications for therapy in various conditions, which tend to derange the usual careful adjustment between fluid intake and outgo is certainly suggested.

I desire to record my appreciation of the work of Captain Baird, Captain Ohler and other officers of the Medical Corps of the A. E. F. who actually made many of the observations which are summarized here.

CYTOLOGICAL STUDIES OF PLEURAL EXUDATES COMPLICATING INFLUENZA.

By Balduin Lucke, M.D., Dr.P.H., 1st Lieut., M.C., U.S.A.,
PHILADELPHIA,
AND
Ruth Barker, A.B., Technician, U.S.A.
ST. LOUIS, MISSOURI.

(From the Cantonment Laboratory, Base Hospital, Camp Zachary Taylor, Ky.)

The exudate of influenzal pleurisy has certain characteristics which distinguish it from the inflammatory effusion complicating the pneumonitis primarily due to the pneumococcus, the streptococcus and other organisms. Thus, most observers lay stress on its thin, often hemorrhagic character and its low fibrin content. This is especially true in the early stages of the disease, the fluid becoming later frankly purulent and thick. Details as to the incidence and appearance of pleuritic involvement have been reported by one of us[1] in a general study on the pathological anatomy of influenza. Inasmuch as we were unable to find information in the literature concerning the cellular composition of the pleural exudate in influenza, the present study was undertaken on the pleural fluids of seventeen cases of influenzal pneumonitis occurring in previously healthy individuals. Clinically, these cases were of the usual type; all terminated fatally; the fluid was obtained at autopsy performed within a few hours after death. It was not possible to determine from the clinical records the duration of the pleural involvement. The total duration of the disease varied from four to thirty days, the majority of deaths occurring from the tenth to the sixteenth day. Grossly the exudate of the cases studied varied in amount from 50 c.c. to 3000 c.c.; it was generally thin, serosanguineous or seropurulent, but in several instances a definitely thick, pleural fluid was present. Cultures of the exudate and of the lungs were made in each instance. The smears were made in the ordinary way, dried in air and stained by Jenner's blood stain or separately by aqueous eosin and methylene blue, after fixation in Zenker's solution, employing the same method that is used for histological sections. It was found that better differentiation was obtained by this method.

Summary of Results. The cells encountered were: Polymorphonuclear leukocytes, large and small lymphocytes and so-called transitional cells slightly larger than the leukocytes and having a single indented nucleus. Besides these there occurred

[1] Lucke, Balduin; Wight, Toynbee; Kime, Edwin: Pathological Anatomy and Bacteriology of Influenza (Epidemic of 1918), Arch. Int. Med., August, 1919.

Autopsy number.	Total duration of disease in days.	Character of pleural exudate.	Amount in c.c.	Bacteria.		Differential cell count of pleural exudates. (In per cent.)					Phagocytosis.
				In pleural exudate.	In lungs.	Polymorphonuclears.	Small lymphocytes.	Large lymphocytes.	Endothelio-cytes.	Transitional.	
209	15	Fibrinopurulent	Small (r); 100 (l)	H.S.; Pnc.	Pnc.	29.3	1.6	4.0	60.1	5.0	Diplococ. seen twice in endothel., once in polys.
169	4	Serosanguinous	Slight (r)	Pnc.	Pnc.	16.5	2.5	6.3	72.0	2.5	None seen.
172	11	Thin seropurulent	220 (r)	B. Inf.; Pnc.	Pnc. I; B. Inf. N.H.S.	23.6	5.0	1.4	68.0	2.0	Occasionally phag. of r. b. c. and of pnc. by endotheliocytes.
202	13	Thick fibrinopurulent	100 (r)	H.S.; B. Inf.	H.S.; Pnc.	..	..	..	100.0	..	None.
188	16	Clear fluid	50	Pnc.	H.S.; Pnc.	1.5	..	..	98.5	..	Very occasional phag. of r. b. c. by endothelials.
228	30	Purulent	3000 (r)	H.S.	H.S.	78.6	0.6	2.6	16.9	1.3	None.
194	16	Sanguinopurulent, thin	1800 (r)	H.S.	N.H.S.	67.9	..	1.3	29.5	1.3	Much by polys.; very occasionally by endothelials of strep. and pnc.
217	27	Yellowish, turbid, flaky	1000 (l)	H.S.	H.S.	76.3	..	8.5	13.3	1.9	Marked phag. of strep. and pnc. by polys.
177	10	Thin, brown, purulent	500 (r)	H.S.; B. Inf.; Pnc.	Pnc.; H.S.	27.5	2.0	8.2	58.7	3.6	None.
184	12	Thin, slightly turbid, straw colored	200 (r; l)	H.S.	H.S.; B. Inf.	8.5	0.5	10.0	77.5	3.5	Marked phag. of strep. by endothelials, occasionally by polys.
214	13	Turbid, flaky	500 (l)	Pnc. II	H.S.	62.6	..	1.6	35.3	0.5	Occasional phag. of pnc. by polys.
259	9	Turbid	250 (l)	N.H.S.	Pnc. III	52.8	1.0	2.0	44.2	...	None.
191	8	Thin, seropurulent	200 (r; l)	Pnc.	Pnc.	17.5	..	7.0	73.7	1.8	None.
190	16	Thin, purulent	100 (r; l)	Pnc.	Pnc.; H.S.	25.3	1.1	9.6	62.9	1.1	None.
170	14	Thin, greenish yellow	1500 (r)	Pnc.; H.S.	Contaminated	82.3	..	0.6	15.9	1.2	Occasional phag. of diplococci by polys and endothelials.
187	14	Greenish, purulent	500 (r)	H.S.	H.S.; Pnc.	68.4	2.3	4.2	23.8	1.3	Marked phag. of diploc. by polys.
201	24	Thin, yellow purulent	1500 (r; l)	H.S.	Pnc.; N.H.S.; B. Inf.	89.9	0.7	2.2	6.8	0.4	Phag. of strep. by polys.

Abbreviations: Pnc., pneumococcus; H.S., hemolytic streptococcus; N.H.S., non-hemolytic streptococcus; B. Inf., Bacillus influenzæ; r, right pleural cavity; l, left pleural cavity; R.B.C., red blood cells.

considerably larger, oval or round mononuclear cells measuring from ten to twenty microns and possessing a large, usually deep staining nucleus, with several prominent nucleoli and pale-staining cloudy protoplasm. These cells resemble in every way the endothelial cells described and pictured by Mallory,[2] Pepper[3] and others. Their cytoplasm frequently shows numerous small vacuoles, probably evidences of degeneration. On the whole, however, they were less degenerated than the polynuclear cells, whose granules were often absent and whose nuclei and cytoplasm were frequently fragmented. Our results are summarized in Table I.

It is seen that in 10 of the 17 cases endothelial cells constituted over 40 per cent. of the total number. In 5 of these they even formed over 70 per cent. of the cells present. Large and small lymphocytes were never marked in amount, being present generally in less than 10 per cent. The polynuclear cells were low in percentage when the endothelial cells were high, and *vice versa*. Analysis in regard to the appearance and the cellular composition of the exudate and the duration of disease brings out that endothelial cells were most numerous in cases of short duration when presumably the pleural involvement was relatively recent and the fluid thin and serous. In cases of longer duration polynuclear cells predominated and the fluid was thick and purulent. Thus, in autopsy 188, where the pleural fluid was almost clear and straw colored, the endothelial cells numbered 98.5 per cent., while in autopsy 228 the fluid was frankly purulent and the cells chiefly polynuclears. Bacteriological analysis brought out no constant features. The organisms present in both the pleural fluid and the lungs were hemolytic and non-hemolytic streptococci, pneumococci and Bacillus influenzæ. The type of the organisms apparently stood in no definite relation to the cellular composition of the fluid. This leads us to believe that the character of the exudate is primarily produced by the soluble virus of influenza and only secondarily influenced by the invading organisms.

Phagocytosis of bacteria was observed in nine of the fluids, the organism being pneumococci or streptococci. The phagocytic cells were chiefly polynuclears, but occasionally endothelial cells contained bacteria. Two of the fluids presented slight phagocytosis of erythrocytes by endothelial cells. In one instance there was a plaque of several endothelial cells apparently recently desquamated; these coherent cells showed no evidence of phagocytosis.

Discussion. The importance of endothelial cells has been especially emphasized by Mallory. According to him they are called forth by mild injurious agents which act, for a considerable length of time, by agents which are mildly toxic or which act

[2] Principles of Pathological Histology, 1914.

[3] Endothelial Phagocytes in Pleural Exudate Due to the Bacillus Typhosus, Am. Jour. Med. Sc., 1916, cli, 663.

mechanically only. Thus they form the chief or only cell reaction to the leprosy bacillus, the typhoid bacillus and usually to the tubercle bacillus and to certain protozoa (Leishmania). They are most prominent where the toxin is most concentrated. For example, in typhoid fever, one sees them especially in the mesenteric and intestinal lymph tissue, the spleen and the liver.

Pepper described endothelial phagocytes in typhoid pleurisy, reviewed the literature and stated that in all effusions due to organisms other than the typhoid or tubercle bacillus the endothelial cells play but a small part and are usually lost sight of in the great polynuclear reaction.

There are certain features which point to a similarity of the toxins of typhoid and of influenza in so far as the cellular reaction produced is concerned. In both diseases there is a distinct and persisting leukopenia and a proliferation of the lymphoid tissue and endothelial tissue, especially in regions where the toxins are most concentrated. Thus in typhoid fever the intestinal and mesenteric lymphoid structures are markedly enlarged; in influenza the peribronchial and peritracheal lymph nodes are highly swollen and histologically their sinuses are packed with endothelial cells. In both diseases we have enlargement of the liver and the spleen and toxic changes in these organs; in 126 influenza livers studied we found focal necrosis in about 50 per cent. It would seem then that Bacillus influenzæ, or rather the as yet not determined virus of influenza, could be added to the list of organism or substances that produce an endothelial cell reaction.

Conclusions. Endothelial cells constitute the predominating type of cells in the exudate of influenzal pleurisies, especially in the early stages thereof; later, they become gradually replaced by polynuclear cells. These endothelial cells are slightly phagocytic for erythrocytes and occasionally engulf bacteria.

REVIEWS

ROENTGEN INTERPRETATION. A MANUAL FOR STUDENTS AND PRACTITIONERS. By GEORGE W. HOLMES, M.D., Roentgenologist to the Massachusetts General Hospital and Instructor in Roentgenology, Harvard Medical School, and HOWARD E. RUGGLES, M.D., Roentgenologist to the University of California Hospital and Clinical Professor of Roentgenology, University of California Medical School. Pp. 211; 159 illustrations; 20 tracings. Philadelphia and New York: Lea & Febiger, 1919.

THE first chapter deals with confusing shadows and artefacts, with an explanation of their most common sources and causes. The second chapter is a short discussion on anatomical variations and development, with a table taken from Rotch and Morris's *Anatomy*, giving the time of appearance of centers of ossification.

The following four chapters are devoted to bone and joint injuries and diseases of bursæ and tendons. Here a wide field has been covered very well, the descriptions being condensed without slighting any of the real essentials. At the end of the chapter on bone pathology there is a table for differential diagnosis. The differential diagnosis of bone diseases is, and probably always will be, one of the most perplexing problems for the roentgenologist, but still we think that the resemblance of carcinoma of bone to bone cyst is not striking enough to devote a differential table to these two conditions.

In Chapter VII the shadow of the chest is divided into (1) that of the thoracic wall; (2) a central shadow consisting of supraposed sternum, heart, great vessels, mediastinum and spine; (3) diaphragm; and (4) the lung fields. The high lights in the chapter are the parts devoted to the heart and lung fields. The former is illustrated with tracings and reproductions showing the points from which measurements are taken, the different dimensions of the average normal heart and the variations in the diameters in cardiac lesions.

The roentgenographic appearance of pulmonary lesions is clearly described, and it is refreshing to note that there is a tone of conservatism running through the discussion on tuberculosis.

The following chapter is devoted to the gastro-intestinal tract. There is little or nothing presented that is new, but the cardinal

points in examination technic are pointed out and the appearances of lesions described in a thorough manner. The book closes with the chapter on the genito-urinary tract. This chapter is of the same general excellence as the others and needs no further comment.

On the whole, Holmes and Ruggles have given the profession a well-illustrated manual that fulfils their hope that it would prove of practical aid to those in search of a working knowledge of roentgen interpretation. It ought to be valuable as a text-book for students and practitioners. J. D. Z.

UROLOGY. By V. C. PEDERSEN, M.D., Visiting Urologist to St. Mark's Hospital, New York City. Pp. 948; 362 illustrations. Philadelphia and New York: Lea & Febiger, 1919.

THE author devotes 680 pages, or 70 per cent., of his new book on *Urology* to the subject of specific urethritis and such allied subjects as are essential to the diagnosis and treatment of the same. Gonorrheal infection, both in the male and in the female, is discussed from every possible point of view, and as a treatise on this one subject his volume is remarkably complete. He has adopted a different system from previous text-books of presenting his subject, discussing first the "pathology in general" of the various types of urethritis, then the symptomatology of these types and in subsequent pages the treatment, etc. To the post-graduate this method of presenting the differential points is good, but to the undergraduate student it is liable to be confusing, as one disease receives attention in scattered and distant portions of the book. Likewise, the method requires frequent reiteration and many references to other pages, and does not permit of ease of style, nor does it hold the attention. The chapters on urethroscopy and cystoscopy are excellent, copiously illustrated and outlining the methods of technic of a careful surgeon. Also the charts advocated for recording cases and the special findings at examination are much to be commended and too generally neglected.

In endeavoring to compile a text-book of Urology in one volume of less than 1000 pages the author has fallen into the error that such an effort inevitably entails, *i. e.*, incompleteness. One misses in the volume a more thorough exposition of the ever-broadening fields of the subject, for it must be remembered that the use of this word to express the scope of the specialty has been founded on the advancement, during the past two decades, of our knowledge in the fields of prostatic and renal surgery, the modern treatment of syphilis, functional diagnosis, cystoscopic operative procedures and the electric and radium treatment of vesical neoplasms. Each of these subjects receives but a cursory handling, oftentimes depending on a lengthy quotation from the original authority for

what should be the author's experience and opinion. One misses entirely a chapter dealing with the disease of the testis; hydrocele, varicocele and testicular tumors are apparently non-existent; the subject of syphilis is completely omitted; epispadias, hypospadias and other surgical abnormalities of the penis undescribed; diseases of the prostate (hypertrophy, contracture of the vesical neck, chronic prostatitis, tuberculosis, neoplasms and lithiasis) are crowded into a scant twenty-one pages at the extreme end of the book (while eighteen pages are elsewhere practically wasted on the subject of urinalysis), so that the impression is gained that the present-day exposition of the field of urology has been woefully misappreciated and neglected. As a treatise on urethritis the book is complete, its text is readable and remarkably free of grammatical or typographical errors. The general make-up of the book reflects credit upon the publishers. A. R.

PULMONARY TUBERCULOSIS. By MAURICE FISHBERG, M.D., Clinical Professor of Medicine, New York University and Bellevue Hospital Medical School. Second edition. Pp. 744; 100 engravings and 25 plates. Philadelphia and New York: Lea & Febiger, 1919.

THIS edition has been largely rewritten, with the addition of new chapters on tuberculosis of the pleura and pneumothorax. All available literature upon the course and prognosis as learned by experience from our recent large army has been reviewed and all essential data incorporated. It is a practical and scientific book upon pulmonary tuberculosis, dealing with the disease from an etiological, diagnostic and treatment standpoint. A great deal of space is given to the importance of childhood infections; a sharp line is drawn between infection and disease or between tuberculosis and phthisis. Many statistics are given to bring forcibly before the reader the urgent need of the care of the child of tuberculous parents. The author believes that a small dose of infection received early in life immunizes the patient to further infection at a later period of life. He points out that before the age of three is the most dangerous time for the child.

Symptomatology of the disease is given its proper place, and to be sure it is the most important anchor to which the clinician can attach himself in determining the degree of activity and whether or not the patient needs extensive treatment. The symptoms are described in detail. The author brings forth that unless the patient be suffering with a toxemia in some form the patient cannot have an active process. The physical signs, their mechanism of production and clinical significance are described in detail with

their proper degree of importance. With a careful history and physical examination, almost all chest conditions can be rightly determined. Physical findings in the lungs without symptoms of a mild or severe toxemia do not indicate active pulmonary tuberculosis. Roentgenography is described as an aid to diagnosis, but is of no value in determining whether the patient is sick with tuberculosis.

The different types of the disease are considered, and especially those of childhood infection. Prophylaxis should be directed to the child, as adult infections are rare. A careful differential diagnosis between tuberculosis and such diseases as cardiac disease, bronchiectasis, pulmonary spirochetosis, influenza, hyperthyroidism, etc., is given. The influence of the recent epidemic of influenza upon tuberculosis is also considered, with a final conclusion that not a great deal of damage was done to the pulmonary invalid.

The chapters upon treatment are full and conclusive. Marked emphasis is put upon the home treatment of cases both before and after sanatorium care. The question is also treated from an economic view. Medicinal treatment as well as the use of artificial pneumothorax in selected cases is fully given. The book is undoubtedly one of the best upon the subject of pulmonary tuberculosis, and deserves a prominent place in the foreground.

T. E. D.

MORTALITY STATISTICS OF INSURED WAGE-EARNERS AND THEIR FAMILIES. The Experience of the Metropolitan Life Insurance Company, Industrial Department, 1911 to 1916, in the United States and Canada. By LOUIS I. DUBLIN, Statistician, with the collaboration of EDWIN W. KOPF, Assistant Statistician and GEORGE H. VAN BUREN, Supervisor, Statistical Bureau. Pp. 397. New York: Metropolitan Life Insurance Company, 1919.

THIS publication comprises statistics covering 635,449 deaths of persons more than one year of age occurring in the experience of the Metropolitan Life Insurance Company between 1911 and 1916 inclusive. Of this number 520,079 were of white persons and 115,370 deaths were of colored, or 82 per cent. were among white policy-holders and 18 per cent. among colored. The death-rate, however, among the colored was much higher because 87.5 per cent. of the exposed were white policy-holders. The data was collected from a geographical area much larger than that of the registration area of the United States, as several States not included in the latter are well represented in this data. It has been collected with the utmost care and many tables carefully compiled. These tables include number and percentage of deaths, by causes, by color, sex and age. All variations are explained in detail and

interesting comparison between the deaths in the registration area and those of the Metropolitan Life Insurance Company are made.

Special chapters are given over to such diseases as tuberculosis, cardiac diseases, kidney disease, pneumonia, malignancy, etc., tuberculosis being the greatest factor or cause of death of the wage-earner: 17.4 per cent. of all deaths were due to tuberculosis. Special attention is drawn to the fact that the mortality from this disease occurs at a time of life when there is still considerable expectation remaining to each individual and when death seriously disrupts family life. The long period of physical disability which usually precedes the fatal termination augments the economical loss.

Organic heart disease ranks second as a cause of death, comprising 11.9 per cent. of the total deaths, death occurring, however, in a greater proportion of cases in the aged.

Other chapters are given over to the diseases of childhood, including measles, scarlet fever, whooping-cough and diphtheria, diarrhea and enteritis and external causes of death (accident, suicide and homicide).

The supplement for 1917 shows a gradual decrease in the number of deaths from all causes notwithstanding there had been nine months of war.

The book is of extreme value to health and public-welfare workers, and should lend a great deal of encouragement to all interested in the care of the wage-earner and his family. T. K.

GYNOPLASTIC TECHNOLOGY. By ARNOLD STURMDORF, M.D., Clinical Professor of Gynecology, New York Polyclinic Medical School. Pp. 334; 152 illustrations and 23 colored plates. Philadelphia: F. A. Davis Company, 1919.

UNDER the term gynoplastic technology the author describes several new plastic operations upon the female genital organs. In presenting these new methods of technic it is with the feeling that we have outgrown many of the older operations which have been passed on from generation to generation, although we have realized for some time that they did not satisfactorily fulfil their purpose. Most of the material in this book has appeared previously in the author's various contributions to current literature, so that the volume may be considered a collective review of the author's own work. Whether one accepts Sturmdorf's tenets and technic or not it is distinctly refreshing to the reviewer to read a book that is original and not merely the same old standardized text-book under a new authorship.

The introductory chapters deal mainly with preoperative prepa-

ration as followed by the author in his work, in the course of which he presents several valuable suggestions on matters that are frequently overlooked in preparing patients for operation. In a chapter devoted to sacral anesthesia many investigators are quoted, but in spite of their enthusiasm the author does not believe in the applicability of sacral anesthesia for plastic work at the present time. Chronic endocervicitis is considered in great detail and in the light of latter-day pathology, a great stress being laid on the futility of curettage as a therapeutic procedure in this condition. Among the other topics considered are perineal lacerations and their repair, fistulæ of the various pelvic organs, cancer of the vulva and congenital malformations of the genital organs. The illustrations are very satisfactory in number and character, many colored plates enhancing this aspect of the book. Although this volume is chiefly of interest to the specialist, some parts of it could be read to great advantage by the physician in general practice.

F. B. B.

GERIATRICS: A TREATISE ON SENILE CONDITIONS, DISEASES OF ADVANCED LIFE AND CARE OF THE AGED. By MALFORD W. THEWLIS, M.D., Associate Editor, Medical Review of Reviews, New York City, with introductions by A. JACOBI, M.D., LL.D., and I. L. NASCHER, M.D. St. Louis: C. V. Mosby Company.

THIS is a very interesting book on the diseases and care of the aged, written by an author who has observed carefully and who pleads eloquently for a more thoughtful care of the aged than the medical profession has heretofore given. It is needless to say that it is a subject very worth while considering by all general practitioners and specialists.

Dr. Thewlis has covered the field from every angle, as his twenty-one chapters will testify. It is surprising, in a way, that medical care of the aged should differ in so many aspects from the care of younger adults. The chapter headings give some idea of lines along which these difficulties are pointed out. The important headings are as follows: The care of the aged, work for the aged, care of the eyes, senile mentality, diet, senile constipation, toxemia, blood-pressure, arteriosclerosis, nephritis, diabetes, prostatic hypertrophy, urosepsis, the checking of hemorrhage, secretions and excretions, malingering venereal diseases, sexual life and surgery of the aged. An interesting chapter on the value of old age encourages us in the hope that none of us need be afraid of getting old and that productiveness and power and influence need not be lost with advancing years.

Dr. Thewlis lays great stress repeatedly on the importance of not letting old people give up and of not permitting them to stay

in bed. There are other not so important repetitions in the text that appear to be unnecessary, and there is evidence that the proof could have been better read; but these minor criticisms can be lost sight of among the many excellent points of the book.

C. N. S.

CEREBROSPINAL FEVER. By C. WORSTER-DROUGHT, M.A., M.D., Capt. (Temp.), R.A.M.C., and ALEXANDER MILLS KENNEDY, M.D., Capt., Late R.A.M.C. Pp. 514; 64 illustrations. London: A. & C. Black, 1919.

THE authors of this excellent volume were fortunately placed for the study of cerebrospinal fever. One of the authors was a neurologist and the other a pathologist and bacteriologist, and their extensive experience in the army, combined with previous observations in civil life, was the inspiration for the monograph.

After some observations about the geographical distribution and seasonal prevalence and age, sex and race incidence, there is a chapter on the meningococcus and allied organisms. The authors apparently consider as allied organisms other members of the Gram-negative group of cocci. The dissemination of the disease and the predisposing causes follow, each claiming a chapter. After the incubation period and the mode of invasion have been discussed there is a long chapter on the symptoms. The different types of the disease are included in a special chapter. In considering complications, hydrocephalus seems to be of enough importance to have an entire chapter devoted to it. There are eleven other chapters, of which the more important are those on the cerebrospinal fluid, diagnosis, prognosis and treatment.

The illustrations are not remarkable. A quite complete bibliography is found at the back of the book. The authors are to be congratulated upon putting out so good a volume, the work on which was done during the stress and hurry of war.

A. G. M.

PROGRESS
OF
MEDICAL SCIENCE

MEDICINE

UNDER THE CHARGE OF

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND,

ROGER S. MORRIS, M.D.,

FREDERICK FORCHHEIMER PROFESSOR OF MEDICINE IN THE UNIVERSITY OF CINCINNATI, CINCINNATI, OHIO,

AND

THOMAS ORDWAY, M.D.,

DEAN OF UNION UNIVERSITY (MEDICAL DEPARTMENT), ALBANY, N. Y.

On the Clinical Evidence of Involvement of the Suprarenal Glands in Influenza and Influenzal Pneumonia.—Cowie and Beaven (*Arch. Int. Med.*, 1919, xxiv, 78) were impressed by the fact that the most striking and most constant symptoms of influenza (asthenia, prostration and low blood-pressure) are also the cardinal symptoms of adrenal disfunction. Other symptoms common to acute suprarenal insufficiency and influenza are nausea, vomiting, epigastric and appendicular pains, pains in the back and tenderness on pressure over the back muscles. The question which arose was: Is there a causal relation between adrenal disfunction and the characteristic symptoms of influenza. The evidence on which the authors base their answer may be summarized as follows: Pathological: Of 70 necropsies on patients dead of influenza 6 showed hypoplasia and 1 atrophy of the adrenal bodies. Tests for suprarenal deficiency: Blood-pressure determinations were made on 25 members of the S. A. T. C. In the 20 uncomplicated cases the average systolic blood-pressure was 115 mm. Hg.; in the 5 pneumonias it was 99. These results are useful only in view of the ages of the patients (twenty to forty), for in typical adrenal insufficiency much lower blood-pressures are the rule. In suprarenal insufficiency, but not in health, there is a rise in blood-pressure after prolonged administration of epinephrin. In influenzal pneumonia a similar rise follows the intravenous injection of 10 mg. of adrenalin four times a day for three successive days. In one case the effect was quite marked, the blood-pressure rising from 119 to 131. In suprarenal insufficiency the

intramuscular injection of 1 mg. of epinephrin causes a rise in blood-pressure which may or may not be greater than in the normal individual, but which is always maintained for a longer period. In influenza, whether complicated by pneumonia or not the rise may be sustained for as long as seven hours instead of the normal one or two. Tests for endocrin disfunction: A common but not invariable feature of certain endocrin diseases is hypoglycemia. In influenza, complicated or uncomplicated, the blood sugar was always within the normal limits. In endocrin disfunction the intramuscular injection of 1 mg. of epinephrin causes a rise in blood sugar which persists for more than the normal hour or two. In influenza and influenzal pneumonia the increase in blood sugar may last for more than seven hours. In endocrin disturbances the ingestion of glucose, 1.75 gm. per kilo of body weight, causes an increase in blood sugar, which does not reach normal for three or four hours, while in normal individuals it returns in two hours. In influenza the blood sugar did not reach the normal within three hours, but did at the end of the fifth. There thus seems to be good evidence for the assumption that the asthenia, prostration and low blood-pressure of influenza and influenzal pneumonia are related to suprarenal disfunction. If such be the case the rational treatment of influenza is the administration of epinephrin. A series of cases received 10 or 15 minims of adrenalin intramuscularly every four hours four times a day. Almost invariably symptoms of epinephrin intoxication appeared—palpitation, nervousness, headache, increased lassitude, twitching, rise in temperature and increase in rate of pulse and breathing. The treatment was therefore abandoned and the conclusion reached that the intramuscular injection of epinephrin was of little, if any, benefit in influenza. According to the authors the explanation of the failure of treatment is to be sought not in the epinephrin *per se* but in the method of administration, and the problem which awaits solution is the discovery of the proper method of administering epinephrin.

The Uric Acid Content of the Blood Compared with the Renal Dietary Test.—BAUMANN and his collaborators (*Arch. Int. Med.*, 1919, xxiv, 70) report the results of 180 renal dietary tests and blood analyses made chiefly on patients suffering from arteriosclerosis and nephritis. During the dietary tests the patients were kept in bed and were given a uniform quantity of food and water. The Mosenthal modification of the Hedinger and Schleyer diet was generally used. The urine was collected in two-hour periods from 8 A.M. to 8 P.M. and in one period of from 8 P.M. to 8 A.M. The blood for analysis was taken before breakfast. One hundred cases with the clinical symptoms of renal involvement showed slight or moderate abnormality in the blood analysis and dietary tests. Sixty-six had an abnormality of the dietary test, while 74 per cent. showed an increased concentration of uric acid in the blood. The authors believe that the uric acid concentration is a delicate, if not the most delicate index of renal function at our disposal. It is certainly better than the urea test and is probably more delicate than the dietary test, which heretofore has been regarded as the most sensitive. A comparison of the results of the bland and low protein with the high protein and salt diet shows that with the bland, salt-poor diet the specific gravity of the night urine tends to be low and with the regular

diet the volume of the night urine is increased in those cases showing fixed specific gravity. It would appear, therefore, that these diets may be used interchangeably, but the bland diet has the advantage of being easily prepared and may be used if the protein diets are undesirable.

A Plea for the Early Administration of Atropin in Pneumonia.—STERLING (*New York Med. Jour.*, August 9, 1919, p. 237) concludes from his clinical experiments that all pneumonia patients should be atropinized from the moment they are first seen by the physician and that all influenza patients, in the present epidemic at least, should be treated as pneumonia patients. His advice may be summed up as give enough atropin and give it early.

Chronic Amebic Dysentery and Emetin-and-Bismuth Iodide.—The conclusions of CARLES (*Am. Jour. Clin. Med.*, July, 1919, p. 470) are as follows: (1) The hydrochloride of emetin, while marvellous in the treatment of acute amebic dysentery, has little influence in chronic amebiasis. (2) The remedy of choice in chronic amebiasis is the double iodide of emetin and bismuth. It is given for twelve days in doses of 0.18 gm. daily in divided doses. Its use is attended by the same dangers as those of emetin and calls for the same precautions. (3) In simple chronic amebiasis apparent cure is the rule; however, if the amebiasis is complicated by infection with trichomonas, tetramitus, and especially lamblia, a cure is the exception. The same is frequently true if there are present in the intestine large numbers of trichocephales, ascaris, etc. (4) In such cases the iodide of emetin and bismuth will have no effect unless the patients first are relieved of the parasites. This is simple except in the case of lamblia, the resistance of which to every known remedy is sometimes extreme. (5) It is always necessary to treat properly any coëxisting gastro-intestinal secretory insufficiency or any gastroneurosis or enteritis resulting from fermentation To depend solely upon the specific treatment may result in failure or in uncertain cure. (6) Chronic dysentery being a chronic malady requires chronic treatment. In spite of the fact that recovery often appears to be complete the successive treatments with the double iodide of emetin and bismuth must be rigidly carried out as a matter of routine.

SURGERY

UNDER THE CHARGE OF

T. TURNER THOMAS, M.D.,

ASSOCIATE PROFESSOR OF APPLIED ANATOMY AND ASSOCIATE IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA; SURGEON TO THE PHILADELPHIA GENERAL, ST. AGNES AND NORTHEASTERN HOSPITALS.

Resection of the Cecum and Ascending Colon.—HORSLEY (*Annals of Surgery*, 1919, lxix, 25) says that when surgeons began to use the needle and thread for uniting intestine instead of mechanical appliances,

lateral anastomosis was much in vogue. Fifteen years ago, when this transition was occurring, probably the majority of all intestinal resections was followed by a lateral anastomosis, particularly if the colon was involved. At present the opposite is true, and even in the large bowel the end-to-end or axial union is becoming popular. Cannon and Murphy, after roentgen examination of animals in which end-to-end and lateral anastomosis had been done, found that there was not the "slightest evidence of stasis of the food in the region of the operation" with an end-to-end method. On the other hand, peristalsis was apparently abolished in the region of a lateral anastomosis, the fecal contents being pushed through the anastomosis only when a column of it extended into the unaffected proximal (oral) loop of bowel where peristalsis was unimpaired. The reasons for this are that the opening is not in the axis of the bowel, the severed circular fibers cannot act upon the bowel contents satisfactorily and there are two blind pouches in which the feces tend to collect. The proximal (oral) intestinal pouch is emptied with great difficulty. Lateral anastomosis is made in the direction of the long muscle of the bowel, and these external longitudinal fibers are split instead of being cut across as in the end-to-end method. Contraction of these fibers tends to close the opening in the bowel and a very long lateral anastomosis has to be made to prevent too much contraction. It requires much more bowel to make a lateral anastomosis than an end-to-end. The objection to the end-to-end method has been that it would leak at the mesenteric border. This is because infection here causes the sutures to give way. It can be avoided by dividing, clamping and tying this space and by clamping and tying the mesentery before opening the bowel. Horsley describes and illustrates a method of excising the cecum and ascending colon with end-to-end anastomosis and an attempt at restoration of the ileocecal valve.

Studies in the Standardization of the Wassermann Reaction.—Brown and Kolmer (*Am. Jour. Syph.*, 1919, iii, 8) say that it is highly important to have all glassware used in the Wassermann reaction (pipette, test-tubes and flasks) chemically clean and free of all traces of acid or alkali by reason of the marked antilytic (anticomplementary) and hemolytic properties of these substances. Amounts of sodium hydroxide as low as 1 c.c. of a 1 to 400 dilution of a $\frac{N}{1}$ solution in 2 or 3 c.c. of fluid may be anticomplementary while 1 c.c. of a 1 to 100 proves hemolytic; approximately 1 c.c. of a 1 to 500 dilution of $\frac{N}{1}$ solution of hydrochloric acid is anticomplementary and 1 c.c. of a 1 to 300 dilution is hemolytic. Bichromate cleaning fluid proved anticomplementary in amounts as low as 1 c.c. of a 1 to 900 dilution and hemolytic in 1 c.c. of a 1 to 600 dilution. It is possible that minute traces of acid or alkali in the glassware may be responsible for falsely positive Wassermann reactions with normal serums, large amounts may produce negative Wassermann reactions with syphilitic serums, probably by reason of the direct hemolytic activity of mineral acids and alkalies in amounts greater than sufficient to destroy the complement. The use of one pipette for measuring different serums in conducting the Wassermann reaction introduces the possibility of carrying over sufficient syphilitic serum into a normal serum to produce an erroneous result

unless the pipette is washed between each serum. The use of a separate pipette for each serum is advisable. Test-tubes must be of a size suitable to the technic in order to avoid too high column of fluid in a narrow test-tube which tends to interfere with hemolysis. Physiological saline solution for the Wassermann reaction should be prepared of chemically pure sodium chloride in freshly distilled water in 0.7 to 0.9 per cent.; preferably 0.85 per cent. The kinds of test-tubes and pipettes advised for a standardized Wassermann technic and methods for cleaning and preparing them are described.

Criteria as to Cure in Syphilis.—Le Comte (*Am. Jour. Syph.*, 1919, iii, 106) says that mercury has not been superseded by arsphenamin, and should be used in every case both early and after the more powerful spirocheticide has controlled the acute features of the infection. Fournier required three years' treatment with it; now, in view of the rapidity with which the lesions not affected by mercury alone can be cleared up by combined treatment and the promptness with which relapse can be detected, this period may safely be shortened. It may be held that a fair time would be six months after all symptoms have disappeared, guarding against relapse and resorting to arsphenamin when it occurs. The methods of administration will have to be varied with the peculiarities of the patient. Injections probably act more quickly and certainly, larger doses may be given safely by inunction, while the pain or inconvenience that these methods cause may make it necessary to treat some cases by oral administration. The choice of a salt can be suited by individual selection, the object being to administer as large doses as can be safely borne by the patient The inference is that in every point except that of length of treatment, Fournier's rules for marriage must be followed; modern diagnosis and treatment gives advantages in detecting and controlling the disease at any time, that enable the physician of today to make concessions that he could not. Summarized criteria for cure today include treatment with arsphenamin and mercury until negative blood findings are secured and treatment with mercury for at least six months after this; observations for eighteen months after this with frequent negative blood examinations followed by negative spinal fluid findings. Any relapse should be considered as a reinfection so far as cure is concerned. Even with this it is scarcely possible to assure the patient that he is cured beyond all doubt; he should be informed of his chances of cure and told to report at yearly intervals, in the absence of symptoms, for further examination.

Cancer of the Tongue (Bradshaw Lecture).—Power (*British Jour. Surg.*, 1919, vi, 336) says that cancer of the tongue has always existed in both men and in animals, the actual cause being as yet unknown. Its rapid increase among men within historical times is the result of two causes, predispoding and exciting. The predisposing cause is the degenerative change taking place as the result of spirochetal infection, the change being accentuated by the lapse of years and by indulgence in alcohol. The form in which the alcohol is taken does not seem to be important; beer, spirits and wine are equally harmful. It is the amount consumed and not the quality which matters. The exciting cause is local infection. The most effective local irritant is tobacco, although

pyorrhea and carious teeth often act as minor exciting causes. The exciting causes may act for a long time, but will not produce cancer, except in the rarest instances, without the long-continued action of the predisposing cause, syphilis. The occasional occurrence of cancer of the tongue in animals and non-syphilized people shows that, as in cancer generally, there is a *tertium quid* as yet undiscovered, which is called for convenience the predisposition to cancer. This predisposition manifests itself in the varying resistance to cancer shown by different persons. Sometimes the course of the disease is rapid and an accidental injury to the tongue is quickly followed by a carcinomatous ulcer; at other times, when every factor seems to be present and the individual ought to have cancer of the tongue, he lives to a good old age and dies of some wholly different disease.

A Study of Peripheral Nerve Injuries.—Joyce (*British Jour. Surg.*, 1919, vi, 418) presents an extensive and careful study of 150 cases of war injured nerves. He has not seen any case of complete physiological division later than twelve months after injury in which the condition was not a complete anatomical section. On the other hand, many cases with palpable spindles on their nerves have been seen with full and complete recovery. Cone made a series of remarkable experiments, from which he concludes that war injured nerves are ready to unite at both ends of the injury before the end of eight months. Joyce's cases seem to confirm this. Joyce concludes that: In the majority of cases delayed end-to-end union of a divided nerve is successful, and this method of repair is that of choice. There is something to be said for reunion of nerve trunks by suture of bulbs. An appeal to results of cases so treated is the only way of settling this important matter. This is being done. The anatomical continuity of a nerve deserves the greatest respect. Exploration of a physiologically completely divided nerve should be done as soon as the condition of the wound permits. Neurolysis combined with capsulectomy of spindle-shaped neuromata has been followed by recovery in most, and improvement in all, cases in which this has been done. Exsection of a spindle-shaped neuroma is not justified unless failure has resulted from a neurolysis capsulectomy. Nerve transplantations and double lateral implantations of the ulnar into the median in the forearm have been followed with some measure of success, including some recovery of voluntary power in the affected muscles; but recovery is slow and uncertain. Nerve growth takes place from both ends of a divided nerve transplant, but axis-cylinders grow down only from the central end. An autogenous nerve transplant, of smaller size than the nerve into which it is planted, is capable of hypertrophy. Axis-cylinders, judged by Tinel's sign, grow at the average rate of 2 mm. per diem. Perineural scar tissue constricting young axis cylinders is the most important factor in hindering recovery.

An Unusual Type of Fracture-Dislocation of the Upper End of the Humerus.—Davies (*British Jour. Surg.*, 1919, vi, 466) reports the case of a Lance Corporal who was thrown from his horse. Roentgen-ray examination showed a subcoracoid dislocation of the head of the humerus, together with a spiral fracture passing downward and inward from the outer part of the head, ending on the inner aspect of the shaft

of the bone just above its center. Under a general anesthetic the dislocation was reduced. Then the fracture was reduced and the arm bandaged to the side of the body. No splint was used. The roentgen rays taken immediately afterward showed the fragments to be in good position and the dislocation satisfactorily reduced. A roentgen ray taken seven weeks after the accident showed union in good position, and the patient left the hospital a few days later with practically normal power of movement in the right shoulder.

PEDIATRICS

UNDER THE CHARGE OF

THOMPSON S. WESTCOTT, M.D., AND ALVIN E. SIEGEL, M.D.,

OF PHILADELPHIA.

Duodenal Stenosis.—CAUTLEY (*British Jour. Children's Dis.*, April-June, 1919) reports a case of a child who was brought to him for attacks of fever and vomiting. The first case in the literature was reported by Aubrey. Meckel quoted two instances. Schafer, Rokitansky and Guyot reported cases. Billard mentioned Schafer's case in his book. Hirschsprung reviewed 16 cases, Silverman 24, Gastner 16, Schegel 29, Cordes 57, Kulyer 46, Spriggs 92, Cowell 92. In all, including the case added by this author, about 100 cases have been reported. The most characteristic group of cases includes those in which the defect is in the neighborhood of the papilla of Vater, the point of entrance of the common bile-duct into the duodenum. In another group are placed those of the duodenal-jejunal junction. The first group may be subdivided according to the site of the defect, being above, opposite or below the papilla. Mere narrowing or an annular constriction partially or entirely obliterating the lumen is rare; also the presence of a complete or a perforated diaphragm, due to reduplication of the wall and consisting of the usual coats of the gut and not merely hypertrophied valvulæ conniventes is rare. Usually there is an upper segment ending in a cul-de-sac and connected with a lower segment by a short band, a thread-like band or mesentery only. The latter is a rare type in which there is a complete interruption of the gut. In stenosis the intervening portions connecting the upper and the lower portions are of varying lengths and degrees of constriction. Atresia may be erroneously diagnosticated as stenosis because of an apparently direct communication between the two segments, the communication taking place indirectly by means of a branch of the duct which opens into the upper segment; a probe can be passed through this and the common duct into the lower segment. Vomiting, with the usual signs of obstruction, is the clinical picture. It may occur even if no food is given by mouth, the stomach becoming distended by normal secretions. Bilious vomiting occurs in about 90 per cent. of the cases if the obstruction is above the entrance of the common duct, and is probably due to an aberrant branch opening into

the dilated first part of the duodenum. Hematemesis is not uncommon. Naturally inanition, wasting and constipation are marked features. If food is taken and life is prolonged, as in some cases of stenosis, the stomach and first part of the duodenum become dilated and hypertrophied and there is a marked gastric peristalsis. The symptoms are practically the same as those of congenital hypertrophic stenosis of the pylorus unless bilious vomiting is also present. A dilated first part of the duodenum gives the sensation of a pyloric tumor, but it is neither so hard nor so well defined as in pyloric hypertrophy. It is perhaps needless to point out that no medical treatment is of real benefit and that possibly life may be saved in isolated cases by early surgical measures. In this case the above symptoms were present. Postmortem showed the stomach dilated and hypertrophied; the pylorus was widely dilated. The first part of the duodenum was widely dilated. The second part for a distance of an inch was extremely stenosed, admitting the passage of a probe, and the duct entered about the middle of the stenosed part.

Malnutrition in Children: A Study of the Examination of Nine Hundred Children under Eight Years of Age.—GORDON and BARTLEY (*Arch. Ped.*, May, 1919). In the examination of 900 children under the age of eight years for nutrition, as shown by appearance, weight and height, it was found that the weight to height basis was the most reliable standard of judging nutrition. Next in value was the weight to age relationship and then the general appearance. These figures show a higher rate of malnutrition than others that have been published for children in large cities. The explanation for this may be that the children of this series were practically referred, because it was thought that, due to their home surroundings and their physical condition, they were in need of a vacation away from their usual environment. The classification of the poorly nourished lessens considerably the incidence of those requiring urgent medical care and treatment. The most critical period of a child's early life is between the ages of two and six years. The chief causative factors of malnutrition in this series were environment and disease from the viewpoint of previous history and the condition at the time of the examination. A previous attack of measles, pertussis and pneumonia were found to have a deleterious effect in the order named, on the subsequent life of the child. Scarlet fever, diphtheria and the other contagious diseases apparently had little effect on the general health after recovery. Conditions present at the time of examination which can be considered as causes of malnutrition were adenoids and hypertrophied tonsils, defective teeth, gastro-intestinal and heart lesions, in the order named. Nationality had some effect on nutrition. The degree of nutrition present in a child should not be judged by one standard alone, but by a comparison of two or more.

The Organization and Methods of Contagious Disease Service.—STOKES (*Penna. State Medical Jour.*, August, 1919) discusses at length this problem as developed in the planning of this type of hospital. In the management of the ideal institution the following rules were evolved from the methods of a number of the best contagious hospitals in this country: "(1) Attendants should change from street to short-

sleeved duty uniform on entering the hospital and make a reverse on leaving. (2) The infection should be limited to the quarters containing the patient. (3) The aseptic character of all corridors and passageways should be rigorously maintained. (4) Areas and objects as follows should be regarded as invariably infected: (*a*) the floor; (*b*) the patient; (*c*) all parts of the patient's room within reaching distance of his bed and in fact, in many hospitals, the entire room as high as a person can reach; (*d*) everything with which the patient or the above-mentioned objects come in contact. This includes bedding, utensils, food, discharges from the patient, etc. (5) A special gown covering the entire costume should be worn by attendants while they are within the infected area. (6) This gown should be removed, properly handled and disposed of in accordance with an exact technic before the attendant enters a clean area. (7) A cap covering the hair should be worn. (8) A face mask should be worn by persons while on duty in an infected area, especially while attending certain types of cases. (9) All attendants should rigorously cleanse the hands and forearms with soap and brush and running water before they leave the infected area. (10) Any article that has touched one of the above mentioned infected objects should be immediately treated as infected. (11) Every infected object should be efficiently sterilized as follows: Dishes should be boiled, garbage burned, dressings and infectious discharges on rags, etc., burned. Gowns, linens, and clothing should be sterilized either by immersion in sterilizing solution followed by steam laundrying, or by steam sterilization with or without subsequent laundrying. The body should be cleansed by washing with soap and water; little reliance is placed on disinfectants. When the patient is discharged mattresses and unwashable clothing and bedding should be sterilized by steam or formaldehyde in special steam sterilizers or rooms and subsequently exposed to air and sunlight. The bed should be washed with lysol and water, and exposed to air and sunlight. The room should be scrubbed (the floors and walls as high as can be reached) with soap and hot water. Radiators, chairs, tables, doors, door frames, door knobs, etc., should be included in this scrubbing. Fresh air and sunlight should be used in every possible way for the control of the infection. (12) The patient should be discharged in such a way as will prevent his infecting the corridors through which he is taken, or his carrying infectious material to the outside. (13) Every patient should be treated individually in a single room rather than collectively in wards. (14) Rooms containing a single type of disease should be grouped in one unit, under a single nurse or a group of nurses who do not care for any other type of disease, even though using an aseptic technic. (15) The privileges of visitors should be restricted. (16) Where patients are kept together in wards, even with the same disease, the beds should be separated by sheet curtains or by glass cubicle partitions. (17) Crowding either by having too many patients to the room or unit, or too many patients for each nurse should be absolutely prohibited. Crowding spells the complete breakdown of any system of contagious technic and subsequent cross-infection. (18) Every entering patient should be detained in "solitary" until the longest period of incubation of a contagious disease is passed (three weeks) before he is placed in any ward or in contact with any other person. This is to prevent crosses from patients incubating one disease

while entering with another. (19) Cultures from the nose and throat should be obtained from all persons entering the hospital as patients or staff, for the detection of carriers; the culture should be repeated on discharge. (20) All female infants should be examined for vaginitis (vaginal smear), and the inevitable rule made never to place two female infants in the same room or to allow diapers, etc., to be washed by floor nurses."

Fat Metabolism of Infants and Young Children: III—Fat in the Stools of Children on a Mixed Diet.—HOLT, COURTNEY and FALES (*Am. Jour. Dis. Children*, August, 1919) continue their studies on fat metabolism. This study presents observations on children whose diet contained a large proportion of mixed foods and gives the findings as to fat percentage and distribution in the stools of a number of children receiving a mixed diet and the fat retention of these children. The material examined consisted of 134 collections of the feces of 62 children from one to ten years of age. In the normal or constipated stools of older children whose diet consisted of milk alone or milk with bread and cereal the fat percentage of dried weight averaged 30.7, which is lower than the average found for similar stools of infants taking modifications of cow's milk. The soap percentage of total fat averaged 60.9, which was somewhat lower than that found in the stools of the infants. The normal and constipated stools of children on a mixed diet showed almost identical average values both for fat percentages of dried weights and for distribution of fat. The fat percentage of dried weight averaged 18.0 and 20.1, and the soap averaged, 45.1 and 47.9 per cent. of the total fat. These values were much lower than those found when the diet contained little or no solid food. In the acid abnormal stools of children on a mixed diet the fat averaged 15.1 of the dried weight. Both the fat percentage of dried weight and the soap percentage of total fat were much lower than in normal stools and the values for fatty acids and for neutral fat were higher. With rachitic children the fat percentage of dried weight averaged 34.7 in the alkaline stools and 24.6 in the acid stools. The values were higher than those found for corresponding types of stools for normal children. The proportions of soap, fatty acids and neutral fats were not significantly different from those of normal children. The stools of children suffering from chronic intestinal indigestion showed a much higher fat percentage of dried weight than those of normal children. The average for alkaline stools was 36.4 per cent. and for acid stools 35.3 per cent. The average percentage of neutral fat was lower in both alkaline and acid stools of those children than in the stools of normal children. The fatty acids were higher than normal, and much higher when the stools were acid. The average fat loss in the stools of normal children varied between 2.6 and 3.0 gm. in all the groups studied, being highest in the stools of children whose diet contained the smallest proportion of solid food and the largest proportion of milk. The normal children on mixed diet retained on the average about 94 per cent. of the fat intake, regardless of the type of stool. The average actual retention was about 38 gm. daily. The children with little or no solid food and a smaller fat intake showed a lower actual and a somewhat higher percentage retention than those on a general mixed diet. The rachitic children showed a slightly

larger fat loss in the stools than the normal children. Their intake was higher. The actual retention equalled or exceeded that of the normal children, and their percentage retention was only a little lower than the normal average. The fat loss in the stools of the children suffering from chronic intestinal indigestion was very great, averaging 7.3 gm. daily in the alkaline stools, and 8.0 in the acid stools. Both the actual and the percentage retention were much lower than normal. The percentage of the intake retained averaged 79.1 when the stools were alkaline and 77.7 when they were acid. When the intake of fat was very high the actual retention was usually as high as that found in normal children.

The Constipating Qualities of Orange-juice.—GERSTENBERGER and CHAMPION (*Am. Jour. Dis. Children*, August, 1919) report observations made on a normal infant of ten months. This was done to ascertain the relative value as a cathartic or laxative of orange-juice to an equal amount of a 10 per cent. sugar solution composed of 6.5 per cent. glucose and 3.5 per cent. sucrose. In one period no difference was shown in the two solutions. In the other period a relative laxative advantage of the sugar solution over the orange-juice, or better, a relative constipating ability of orange-juice as compared with the effect of the 10 per cent. sugar solution was shown. During the sugar solution period anywhere from 95.71 to 96.53 per cent. of the water output went by the way of the kidneys, and from 4.29 to 3.47 per cent. of the water output went through the intestines, while in the case of the orange-juice from 97.15 to 97.25 per cent. of the fluid output went by the way of the kidneys, and from 2.85 to 2.74 per cent. by way of the intestines. In other words, orange-juice, relatively speaking, has been less laxative than a 10 per cent. sugar solution when given in doses of 15 c.c. six times in twenty-four hours. This observation confirms the authors' practical experience that orange-juice in the maximum amounts ordinarily used has more of a constipating effect than a laxative one, and they think that it should be used only as an antiscorbutic or as a diuretic and not as a laxative, and especially not in children who are already constipated. These observations also point to the important role that diuresis may play in the production of constipation, and it may be possible that some of the cases of constipation in infants supposed to be due to abnormally long retention of feces in the gut, and a consequent too complete absorption of water in the large intestine are primarily due to a factor that causes an abnormal increase of excretion of water through the kidneys.

The Shick Reaction and Its Practical Application.—PARK (*Arch. Ped.*, May, 1919). The results of embodied clinical and laboratory experience in testing the blood for antitoxin in cases of diphtheria and in persons in contact with diphtheria who have no antitoxin or only a minute amount in the blood and tissues show the value of this examination. The methods previously in use for the estimating of antitoxin, and thus separating susceptible from non-susceptible individuals, have been too troublesome and time consuming to be of practical value in routine cases. Shick in 1913, published the description of a simple clinical test, by which this can be accurately accomplished. The action

depends on the local irritant of minute quantities of diphtheria toxin when injected intracutaneously. If antitoxin is absent, or present only in small amounts, insufficient for protection from diphtheria a positive reaction will appear in from twenty-four to forty-eight hours. The amount of toxin injected, as advised by Shick, is $\frac{1}{50}$ minimum lethal dose for the guinea-pig in 0.1 c.c. of normal saline solution. The author prefers $\frac{1}{5}$ minimum lethal dose in 0.2 c.c. of normal saline solution. It is necessary to give it intracutaneously so that the toxin will remain in the dense tissue and have time to exert its irritant action. The Shick reaction has been carried out for the last five years on all patients admitted to the scarlet fever pavilion of the Willard Parker Hospital. Only cases giving positive reaction were immunized against diphtheria; those giving a negative reaction were given no immunization, but were carefully observed. Though many of these became carriers of virulent diphtheria bacilli, no cases of clinical diphtheria developed. Those reacting to the test received injections of diphtheria antitoxin. It was found that the greatest susceptibility to diphtheria was between the first and fourth years. Toxin-antitoxin used as a vaccine has proved to be as effective an immunizing agent as typhoid vaccine. It is absolutely harmless. No reaction develops in infants while in older children and adults a moderate swelling of the arm may appear and lasts for one to three days. One injection gives immunity to 80 per cent. of those previously susceptible. Two injections give immunity to 90 per cent. and three injections to 97 per cent. Immunity conferred lasts for at least three years and probably much longer.

OBSTETRICS

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA.

The Injection of Fluid into the Placenta to Aid in the Separation.—FREY-BOLLI (*Jour. Corresponz-Blatt, f. schweizer Aerzte*, April 19, 1919) has injected fluid into the placenta through the umbilical vein to make the placenta larger and heavier. To facilitate its separation, the fluid irrigates the wall of the uterus, causing it to contract and increasing its action in separating the placenta. The maternal stump of the cord should be wrapped in sterile gauze, as soon as it is divided, to maintain the sepsis, should it be necessary to inject fluid later. In 3201 deliveries, there were 53 cases of the retention of the placenta with hemorrhage. After injecting fluid, the placenta was spontaneously discharged in 46 per cent., and with like pressure in 41.5 per cent. In 7.5 per cent. placenta was expelled under general anesthesia, and in only 2 cases, 3.7 per cent., was manual delivery of the placenta required. The earlier the fluid is injected, the better, before the uterine muscle becomes exhausted. From 300 to 500 c.c. of saline and boiled water is used. If this produces no result, it is allowed to run out, and the same amount is again injected and, by repeating the proceeding, success follows.

Retention of Urea in Kidney Disease.—SCHELL (*Norwegian Jour. Med.*, April, 1919), in 25 cases of acute nephritis, observed recovery or material improvement. There was retention of the urea in both the blood and the spinal fluid, but it never exceeded 1.94 per thousand, and usually grew less. In 19 cases, the urea was over 2 per thousand, and these all had an unfavorable termination in a short time. When the urea rose to over 4 per thousand, death occurred in a few days. One must not be misled by a low urea percentage; for, when this reaches 1 per thousand, a fatal result may follow. There is no relation between the reduction of urea and dropsy. On the contrary, the greater the urea retained, the higher is the blood-pressure; but these phenomena are independent of each other and may occur separately. When headache, lack of appetite and vomiting are unfavorable symptoms in these cases, they are less important than the reduction of the urea. These studies throw some light upon eclampsia and lead us to recognize the fact that this may occur with or without uremia. In the toxemia of pregnancy, the percentage of urea in the blood is a valuable indication of the gravity of the case.

The Continued High Maternal Mortality of Childbirth.—BONNEY (*Lancet*, May 10, 1919) believes that it will be impossible to establish large lying-in hospitals, maintained by public funds, either national or municipal, until the public has been made to understand that labor itself is a surgical operation. Such hospitals should contain free beds and, in addition, paying wards and separate rooms for those who can afford them. Obstetrical teaching will, naturally, be done at these hospitals, and students should live in them for at least three months. Out-patient obstetrical service, as conducted at present, should be abolished. This perpetuates all that is bad concerning obstetrics, at the present day. When a student is obliged to conduct cases of labor in these surroundings, he comes to believe that the hospital practice is theoretical and not intended for general use. Patients taking private rooms should be attended by their own physician, and should pay him adequate fee. He should have the services of the residents, as required. The writer of the article quoted has stated clearly some of the most important elements which prevent improvement in obstetrical practice. His statement that out-patient practice is objectionable would be denied by many, but it is, nevertheless, true. No other department of medicine would think of teaching students in this manner or to subjecting its patients to such unfavorable conditions.

The Transmission of Malaria through the Placenta.—GENTILI (*Jour. Amali di Osdetricia*, Nos. 3 and 4, 1919) contributes an extensive paper on this subject, with a report of 29 collected cases, and adds one case resulting fatally, in which autopsy on mother and child was obtained. In the mother, the autopsy showed irritation of the meninges and congestion of the cerebellum; hypostatic congestion of the bases of the lungs; fluid in the pericardium, the heart muscle flaccid; the endocardium and valves normal, involvement of the lining membranes of the aorta; the kidney distended and the capsule not separating easily; the spleen swollen, its pulp dark red in color, while the organs of special sense in the body seemed not to have been disturbed. The

uterus was seven months pregnant and the fetal sac unbroken, and the child not macerated. The essential features in the autopsy in the mother intersticed of nephritis and acutely infected spleen, beginning atherosis of the aorta, congestion of the right lung and congestion of the membrane of the brain. The blood was altered and masses of coloring matter had escaped from the vessels. Autopsy on the child showed changes in the blood, although the greater portion of the fetal organs were healthy. The placenta, membranes and cord showed granules of blood pigment deposited in masses in the placenta. The feature was one of blood infection, plainly traceable through the placenta.

Tuberculosis of Pregnancy.—FUNK (*Med. Clinics of North America*, 1918, No. 2, p. 803) discusses the general subject of tuberculosis complicating pregnancy and adds five case reports. Among 200 married women with pulmonary tuberculosis, 30 per cent. stated that the first signs of their disease became apparent during or following pregnancy. It seems most likely that many of these patients have tuberculous lesions which were not active before pregnancy. Among women of childbearing age, tuberculosis is very fatal. This results largely from the fact that pregnancy and parturition lower the patient's vitality and spread new foci of infection by the violent respiratory movements made during vomiting or during labor. Sterility is rare among patients with pulmonary tuberculosis. Conception may occur, even when the disease is far advanced. Among 100 patients having tuberculosis 18.8 per cent. had miscarriages. In view of these facts, tuberculous women should be advised against marriage and conception, unless the lesion has been cured. The only test for this would be the fact that the patient had remained well for two or three years under the ordinary conditions of life. When tuberculosis is active and in the early stages, if conception occurs, pregnancy should be terminated before one and one-half months. Before making diagnosis, the patient should be kept in bed and examined several times by a specialist, and, if it is found that the tuberculosis process is progressing, an obstetrician should be asked to empty the uterus, with as little disturbance as possible. For anesthesia ether should not be used. When the tuberculous lesion is in its first stage, and the process is not active, if the best hygiene can be secured, the pregnancy may be carried on. If, however, at any time the tuberculosis becomes active, the indication is for radical treatment. If the tuberculosis is active and in the early stages, while the pregnancy is in the latter part, it is permissible to carry the patient on as near the natural termination of pregnancy as possible. Where the tuberculous process is very far advanced, no interference should be used Unless the mother's tuberculosis has developed very greatly, the children born are frequently healthy. It is rare to find congenital tuberculosis. Tuberculous mothers should not nurse their children, and care should be taken not to infect the child from the mother's hands or through the discharges from the mouth. This precaution is of very great importance.

Postpartum Shock.—BERMEUN (*Argentine Review of Obst. and Gynec.*, 1918, No. 2, p. 417) reports the case of a primipara in whom labor lasted sixteen and one-half hours, the second stage four hours. The

child weighed 3000 grams. The placenta remained in the vagina, the membranes adherent to the uterus. The patient had pronounced shock, which was made worse by efforts to remove the placenta. The placenta was rapidly delivered, but there was no hemorrhage, the blood ducts being only about 500 drams, and the patient rapidly recovered under stimulation. The symptoms were thought to be of acute anemia, but, as the patient had no hemorrhage, this could not have been present. Shock during or immediately after labor, in poorly developed primiparæ is not infrequently observed, and may be without apparent cause.

Abdominal and Vaginal Section in Cases Complicated with Infection.—D'ERCHIA (*Annales di Osterticia e Ginecologia*, 1919, Nos. 5 and 6) contributes a paper upon this subject and reports the case of a patient in labor with prolapsed arm and uterus slightly contracted. The amniotic liquid had been completely discharged and there was a putrid, and discolored, vaginal discharge. The temperature was much elevated, the pulse 120. Methods of dilating the cervix failed and the patient's condition was such that no violent efforts at dilatation could be endured. A typical Porro operation was performed successfully. A second primipara, above the average in age, was admitted, having a rachitic pelvis. The fetus was dead and there were evidences of infection. In this case, also, a Porro operation was successfully done.

The Problem of the Cystocele.—WARD (*Am. Jour. Obst.*, May, 1919) contributes a paper giving the results of his experience during eleven years of operative work. He believes that cystocele is the composite result of several injuries. A method of treatment by operation should aim to correct all the lesions so that there should be no weak spot. The bladder must be mobilized and elevated and the excess bladder drainage must be disposed of with the increased anteroposterior length of the vaginal wall. The operation must also restore the normal attachment of the vagina to the cervix, for the severing of this attachment is one of the principal causes of prolapse. So also the uteropubic ligaments and the vaginal wall just above the pivot point must receive attention. The lesions which bring about cystocele occur in parturition and hence obstetricians are interested in any paper bearing upon these phenomena.

A Method of Demonstrating with the Hands the Mechanism of Labor and the Various Types of Pelves.—MORAN (*Am. Jour. Obst.*, June, 1919) contributes an illustrated paper showing his use of the hands in various postures to illustrate some of the essential facts in obstetrics. The hand closed as a fist has several diameters which may illustrate relatively those of the pelvis. In various positions the true conjugate can be illustrated or the hands combined may be employed to illustrate the mechanism of labor.

Reconstruction of the Uterus.—ROBINS (*Surg., Gynec. and Obst.*, May, 1919) reports two cases in which patients had suffered with indefinite symptoms, suggesting the presence of a fibroid tumor. At operation, a small fibroid was found at the fundus, in one case chronic appendicitis, while both patients had the endometrium greatly thickened and diseased. The operation consisted of excising the fibroid, curetting

the uterus through the incision and bringing the tissues together. One patient had two abortions following the operation; but, five years later, gave birth to a healthy child. The second patient remained unmarried. The purpose of the operator in these cases was to retain the uterus and to remove the pathological condition which was evidently causing, or might cause, sterility.

An Analysis of 304 Cases of Ectopic Gestation.—FARRAR (*Am. Jour. Obst.*, June, 1919) has studied 309 cases of ectopic gestation treated in the Woman's Hospital of the State of New York. As regards the cause of this condition there is reason to believe that infection or mechanical alteration due to adhesions of the fallopian tube predispose to ectopic pregnancy. The most usual time for the development of symptoms, especially acute, is when the period is expected or just after the normal period. Unless an ectopic pregnancy has ruptured there is always pain either with or without bleeding. This pain is more calm like and bearing down than tearing or lancinating. When the patient has unusual one-sided pelvic pain with evidence of irritation of the peritoneum and attacks of fainting a diagnosis of ectopic pregnancy is strongly suggested. Every case demands operation in a hospital so soon as possible and if the patient is in a serious condition no minute examination should be made until the hospital is reached. Unless the other tube is evidently diseased it should not be removed.

Cesarean Section under Unusual Conditions.—CONAWAY (*British Jour. Obst.*, June, 1919) reports the case of a primipara forty-one and a half years old, admitted to the hospital at full term pregnancy, suffering from peritonitis. There was slight albuminuria and a two plus Wassermann reaction. The abdomen was enlarged and flattened, the pelvis slightly contracted. Pains had begun twenty-four hours before admission, with little progress. The cervix was so rigid that under anesthesia not more than three fingers dilatation could be secured. After forty-eight hours of irregular uterine contractions with no progress, section was performed. The uterus was adherent to the peritoneum on the right side, the mesentery adherent to the fundus. There were twin children, one of whom was cyanosed and resuscitated with difficulty. The source of the peritonitis was found in the appendix, which was postcecal and embedded in an inflammatory mass. There was no abnormal condition of the tubes or ovaries. The fallopian tubes were tied with double ligatures as the patient's condition was so grave that haste was imperative. The patient had a complicated convalescence, with chills, excessive sweats and bad heart action and failure of the intestines to act for four days. Pus formed and gravitated to a cul-de-sac whence it was removed by puncture and drainage. The mother finally made a good recovery and the children did fairly well. A second case was that of a negro primipara, pregnant at term, with incomplete intestinal obstruction. The usual methods of emptying the bowels failed. It was necessary to perform section and the child was delivered by section. The obstruction to the bowel was caused by a large inflammatory mass on the right side. This contained the appendix very much enlarged and adherent, a large pyosalpinx and a diseased ovary. The left tube and ovary were normal. There was no gangrene and no free pus. The patient had a difficult convalescence and acute peritoneal inflammation

continued about a week. The lower part of the abdominal wound became infected and there was much difficulty in keeping the bowels open. The second week after operation the peritonitis subsided, the wound closed rapidly, the uterus contracted well and mother and child made a good recovery. Another negro primipara was brought to the hospital pregnant at term, having had pains during the preceding night. On examination the cervix admitted two fingers and a foot was presenting. The pelvis was slightly smaller than normal. Pains continued until the body of the child was delivered when the head failed to rotate and remained transversely across the superior strait. On consultation it was decided that decapitation and craniectomy were indicated. Accordingly the placenta and a very large head were immediately removed through a median incision in the fundus. The gauze drain was left in the uterus and the patient made a remarkably good convalescence. In the fourth case, a primipara, suffering with ectopic convulsions, albuminuric retinitis was so far advanced as to cause total blindness. There was general edema of all the muscles. Only 4 ounces of urine had been obtained by catheter in twelve hours and this showed a high percentage of albumin, and casts. The patient was delivered by section and a living child easily removed. To prevent future conception both tubes were removed. The mother made a fairly good recovery and the child survived.

GYNECOLOGY

UNDER THE CHARGE OF

JOHN G. CLARK, M.D.,

PROFESSOR OF GYNECOLOGY IN THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA,

AND

FRANK B. BLOCK, M.D.,

ASSISTANT INSTRUCTOR IN GYNECOLOGY, MEDICAL SCHOOL, UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA.

Coexistent Disease of the Appendix and Pelvic Organs. — All surgeons who have had much experience with pelvic disease in the female will agree that disease of the appendix is often associated with disease of the female generative organs. This combination is so commonly seen that we seldom stop to consider in which organ the involvement was primary because it makes little difference so far as treatment is concerned in the average cases. An analytical study of this study has been made by CHILD (*Am. Jour. Obst.*, 1919, lxxx, 31) in a large series of cases and he states that where the primary infection is in the appendix it is unusual to observe any very extensive pathological changes in the pelvic organs. A few restricting adhesions that, aside from the subjective symptoms they may cause by restricting the mobility of these organs, are of little moment, seldom if ever causing permanent tissue change to be observed. An exception to this may, however, be taken when the appendix is in the pelvis and suppurative, for in such cases it is not unusual for the pus to gain access to the tube through the fimbriated opening, or to the ovary through the site of a recently

ruptured Graafian follicle, and cause extensive adnexal destruction. When the primary infection is in the adnexa, the secondary involvement of the appendix becomes a much more serious matter, for here extensive pathological changes often take place that later break out into an acute attack menacing the life of the patient if the appendix is allowed to remain. The interference with nutrition alone to a slightly involved appendix resultant on the removal of the right appendages may be sufficient to cause a rapid degeneration in that organ. In the 746 cases of this series, the appendix was removed 339 times. It was pathological 244 times, giving a percentage of 32.57 for the whole series. This percentage was much higher in the inflammatory conditions of the adnexa, where it averaged 46.70 per cent. In the cases where the inflammatory affection of the adnexa was limited to the right side, the percentage of involvement of the appendix was 66.66, while in those where it was on the left side only the appendix involvement drops to 18.42 per cent. The appendix was found in the pelvis adherent to diseased right adnexa in 75 cases. Of these 25 showed acute inflammatory changes while 37 were either subacute or chronic. Gas distention of the appendix was encountered three times. Only once was the appendix or any part of it found to the left of the mid-abdominal line, and in this case, a very long appendix measuring over five inches in length, was drawn well over into the left abdominal quadrant where it was adherent to the sigmoid. As a result of this study Child concludes that disease of the pelvic organs in the female is an important exciting cause of appendicitis, and to a lesser extent the appendix may be a cause of right adnexal disease, but in by far the greater number of cases of coëxistent pelvic disease and appendicitis, the primary source of infection is in the pelvis. Involvement of the appendix is nearly four times more frequent in right adnexal disease than in left and as the possibility of an involved appendix should always be borne in mind when operating upon diseased adnexa, so also should the possibility of diseased adnexa be borne in mind when operating on the appendix.

Chronic Endometritis.—Chronic endometritis is an inflammatory process in the stroma of the endometrium characterized chiefly by a more or less marked infiltration of small round cells, with or without the presence of plasma cells. Formerly the term "chronic endometritis" was applied in a rather indefinite manner to numerous lesions of the endometrium, many of which were not of an inflammatory nature. The investigations of Hitschman and Adler in 1907, which have been universally accepted, showed that many of the so-called cases of chronic endometritis were in reality cases in which the endometrium was normal and the changes in structure that had been noted were merely the physiologic changes which occur as a result of the menstrual function. Following this study, it became a fairly general opinion that chronic endometritis was a comparatively infrequent condition. This opinion is now questioned by SCHWARTZ and KOHLBRY (*Jour. Missouri State Med. Assn.*, 1919, xvi, 209), who state that during the course of two and one-half years in the examination of curettings in the routine manner, it was very surprising to note the unusual frequency with which the diagnosis of chronic interstitial endometritis was being made. They felt that perhaps they had been too free with the diagnosis of chronic

inflammation and thought it would be interesting to study these cases as a whole in order to confirm or modify their previous findings. Their belief is that in order to make a diagnosis of chronic inflammation, it is necessary to find small round cells, if alone, in considerable quantity. These must infiltrate the upper half of the endometrium either in a diffuse manner or appear in small groups. They should also be found, when they are present in any great number, grouped around the glands, both superficial and deep. In their study of 305 specimens of endometrium, they were able to diagnosticate chronic interstitial endometritis in 70 cases which were divided into classes according to the menstrual phase to which they belonged. This placed 16 specimens in the early premenstrual phase and none in the later period. There was 1 menstruating uterus. Postmenstrual mucosæ were found fifteen times, seven early and eight late. Thirty-seven specimens were found in the interval, eighteen in the early interval and nineteen in the late interval. The glands were pathological in twelve instances, the diagnosis of gland hypertrophy being made five times, and gland hyperplasia seven times. There was one senile endometrium and in two cases there was tuberculosis. Small round cells were found alone twenty-four times, with plasma cells forty-one times, and with polynuclear leukocytes five times. As a result of their study they feel that chronic interstitial endometritis is rather frequently met with and also that the presence of small round cells alone in marked numbers, as was the case in twenty-four instances in this series, is sufficient evidence on which to base a diagnosis of chronic interstitial endometritis.

Radium in Genital Cancer.—It has been several years since we have had any reliable statistics on radium therapy from Germany and therefore the report and conclusions of BUMM (*Zentralblatt f. Gyn.*, 1919, i, 1), who is the professor at the University of Berlin, are of interest. Between the years 1913 and 1915 he subjected 401 cases of genital carcinoma to radiation with mesothorium or radium and in the three to six years that have since elapsed he has had ample opportunity to study the end-result. Before presenting his views on the subject it is worth while to review the accompanying tables that he has presented. The operative mortality in cancer of the cervix when the radical operation was employed in 203 cases in the author's clinic from 1911 to 1915 was 13.8 per cent. Of 157 cases operated upon between 1911 and 1913, 77 were well after from six to eight years, which means a cure of 49 per cent. Comparing this to the cases treated by radium, we see that the percentage of cures after radium in operable and borderline cases of carcinoma of the cervix is one-third less than after operation at the end of six years. When the cases are only observed over a period of three years the results of radiation surpass those of operation in cervical cancer, since 55 per cent. of the operable cases remained well. It has been stated that recurrence of carcinoma after it has been healed by radium will occur within the first year if it is going to occur at all, but Bumm has found this to be wrong, as he has had many recurrences after one, two and three years. There were 22 cases of carcinoma of the vagina in this series of which 22 per cent. were healed at the end of three years, which is a better result than is found after operation. Of 13 cases of cancer of the vulva, 9 have already died of recurrence. Of

the 5 cases of urethral cancer that he treated, 3 have remained well, a cure of 60 per cent. The author states that in general the soft medullary cancers are more easily influenced by radiation than the hard growths and adenocarcinomata, but every case is different as regards treatment and no standard dose can be stated for all cases. As a result of his work he concludes that it is not proper to treat all genital carcinomata by radiation. Cancer of the mammary gland, vulva and ovary should be operated upon and then subjected to radiation. Likewise cancer of the fundus should be operated upon when the condition of the patient permits. On the other hand all cancers of the vagina and urethra should be radiated instead of operated upon. In cancer of the cervix, he prefers operation when the case is early and the patient in reasonably good condition. In cases in which operation is contra-indicated on account of age, general condition, heart or bloodvessel radiation should be resorted to.

Type.	Number.	Cured.	Cured, per cent.
1913			
Cervix, operable	14	4	28.5
borderline	22	5	23.0
inoperable	42	2	4.7
Fundus, operable	1	0	
Vagina, operable	2	1	
inoperable	7	0	
Urethra, operable	1	1	
Vulva, operable	1	1	
Recurrences after operation	25	0	
1914			
Cervix, operable	20	4	20.0
borderline	21	4	19.0
inoperable	36	2	5.5
Fundus, operable	3	1	
Vagina, inoperable	5	0	
Vulva, operable	7	3	
Urethra, operable	2	2	
inoperable	2	0	
Recurrences after operation	37	5	13.5
1915			
Cervix, operable	40	22	55.0
borderline	38	15	39.0
inoperable	49	5	10.0
Fundus, operable	1	0	
Vagina, operable	4	2	
inoperable	4	2	
Vulva, operable	5	0	
Recurrences after operation	12	0	

A Study of Bladder Function.—Incomplete evacuation of urine from the kidneys or bladder is not infrequent and CURTIS (*Surg. Gyn., and Obst.*, 1919, xxix, 24) believes that it deserves more investigation than has been accorded it. He has been studying that phase of the subject which has to do with failure to empty the bladder, using for this purpose the bladders of twenty-two male rabbits, which were paralyzed by cutting the spinal cord. This injury produces a bladder paralysis entirely analogous to that which occurs in soldiers consequent to gunshot injuries of the spine and cord. The animals were housed in sanitary

cages which permitted immediate drainage of voided urine. The buttocks and genitalia were kept clean through shaving, aided by bathing and application of petrolatum many times daily. Bladder paralysis was obtained in every case and vesical distention was present in all except one rabbit which died three days after operation. The degree of distention was moderate in eight; in the other thirteen cases the bladder filled the entire lower abdominal cavity. One rabbit without anatomical obstruction to the urinary flow, died in consequence of spontaneous rupture of the bladder. Extensive vesical erosions or ulceration occurred in nine instances, while hemorrhages in the submucosa were frequent. The ureters of four were not distended and those of three were doubtful, whereas fifteen were unquestionably dilated, some to an extreme degree. Of the dilated ureters both were involved eight times, the left alone five times, the right alone twice. The kidneys were of much interest. Of the 22 cases, 7 were normal and 15 pathological. The microscope revealed that 7 had nephritis, and 6 showed notable round-cell infiltration. Intense congestion with more or less hemorrhage was frequent. Bacteriological study showed that infection was evident in 12 of the 22 cases. Of these, the mucosa of one ulcerated bladder was packed with polynuclear leukocytes, but bacteria were not obtained. In the other 11 infected cases many bacteria were found in smears and cultures; one of them must be excluded from consideration because there was an associated beginning peritonitis, leaving 10 cases of undoubted urinary tract infection with numerous bacteria in every instance. These experiments upon rabbits indicate that the unrelieved paralyzed bladder offers a two-fold menace to health: (1) through frequent infection of the urinary tract due to contamination of static urine; (2) through back-pressure which distends the ureters, seriously interferes with kidney function and damages the kidney tissue. It would appear advisable, therefore, to maintain the paralyzed bladder in a state of freedom from residual urine, thus minimizing the danger of kidney involvement. From a clinical standpoint this study would seem to show that irregularly performed catheterization for retention of urine is unsatisfactory and patients so treated are subjected to such dangers as accompany the passage of the catheter and at the same time are rendered liable to accumulations of infected stagnant urine. On the other hand, carefully managed catheterization of the bladder which fails to empty spontaneously, yields excellent results; the catheter should be regularly passed often enough to prevent vesical distention and its use must be persisted in until daily tests show that residual urine is no longer being retained in the bladder.

Notice to Contributors.—All communications intended for insertion in the Original Department of this JOURNAL are received only *with the distinct understanding that they are contributed exclusively to this* JOURNAL.

Contributions from abroad written in a foreign language, if on examination they are found desirable for this JOURNAL, will be translated at its expense.

A limited number of reprints in pamphlet form, if desired, will be furnished to authors, *providing the request for them be written on the manuscript.*

All communications should be addressed to—

DR. GEORGE MORRIS PIERSOL, 1913 Spruce St., Philadelphia, Pa., U.S.A.

LABORATORY PRODUCTS

Our advantages make us headquarters for the organo-therapeutic products

Pituitary Liquid—is physiologically standardized and is free from preservatives.
1 c. c. ampoules, boxes of six.
Thromboplastin solution, 25 c. c. vials.

Thyroids—Standardized. Powder; Tablets, ¼ gr., 1 gr., ½ gr., 1 gr.

Pineal Substance—Powder and Tablets, 1-20 grain.

Parathyroids—Powder and Tablets, 1-20 grain.

Pituitary, Anterior—Powder and Tablets, 2 grain.

Pituitary, Posterior—Powder and Tablets, 1-10 grain.

Doctors Should Specify

In a paper on Corpus Luteum in the New York Medical Journal, Dr. Sajous states:

> "The two most important prerequisites to success in the use of the drug appear to be:
> "1. The selection of a preparation made exclusively from the corpora lutea of pregnant animals, and
> "2. Due attention to the fact that the action of the drug is frequently slow in asserting itself and that the drug should be given up only when thorough trial has demonstrated its lack of efficiency."

Corpus Luteum (Armour) is made from true substance. The glands are gathered in our abattoirs and we know what we are using.

Corpus Luteum (Armour) is supplied in 2-grain capsules, bottles of 50; 5-grain capsules, bottles of 50; 2-grain tablets, bottles of 100.

Specify ***Armour's*** and you will get the best the market affords.

ARMOUR & COMPANY
CHICAGO

THE RELIABLE SOLUTION TO THE SAFE MILK PROBLEM AS IT AFFECTS INFANTS NURSING MOTHERS & CONVALESCENTS

"Horlick's"

The Original
Malted Milk

Produced under the strictest hygienic conditions from clean, fresh milk and choice malted cereals, with the vitamine content intact, and being supplied in sterilized, hermetically sealed glass jars, is protected indefinitely from contamination and deterioration in any climate. And so affords at all times an adequate, safe and convenient food for infants, nursing mothers, invalids and convalescents.

AVOID INFERIOR IMITATIONS—SAMPLES UPON REQUEST

Horlick's Malted Milk Co., Racine, Wisconsin

Sustaining, Invigorating, Partially Predigested

Borden's Malted Milk offers the tissue-building and invigorating nutrition of clean, wholesome milk and sustaining cereals in a partially predigested form.

These invaluable ingredients are combined by an exclusive process of preparation whereby malt ferments acting on the proteins convert them to partial peptones.

This partial predigestion makes Borden's Malted Milk unequalled as a tonic-food for convalescents, dyspeptics and aged people. It supplies maximum nourishment with a minimum strain on the gastro-intestinal tract.

Samples, analysis and literature on request.

BORDEN'S CONDENSED MILK COMPANY
Established 1857
Borden Building New York

Borden's
THE IMPROVED
MALTED MILK

Hygiene and Public Health

By GEORGE M. PRICE, M.D.
Director Joint Board of Sanitary Control, New York, etc.

12mo, 260 pages. Cloth, $1.50, net

THE new (2d) edition of this epitome is up-to-the-minute, particularly on Prevention of Infectious Diseases.

Roentgen Interpretation

For Students and Practitioners

By GEO. W. HOLMES, M.D.
Roentgenologist to the Massachusetts General Hospital and Instructor in Roentgenology, Harvard Medical School

AND

HOWARD E. RUGGLES, M.D.
Roentgenologist to the University of California Hospital and Clinical Professor of Roentgenology, University of California Medical School

Octavo, 211 pages, with 181 engravings
Cloth, $2.75, net

A BOOK of practical aid to those in search of *a working knowledge of roentgen interpretation*. The essentials are presented in comprehensive form. The illustrations have been chosen as types of lesions or as momentary phases of constantly changing and extremely variable processes.

LEA & FEBIGER

PHILADELPHIA
706–8–10 Sansom Street

NEW YORK
2 West 45th Street

HORMOTONE

The pluriglandular treatment of

Suprarenal Insufficiency

Hormotone is a combination of those hormones, or internal secretions, which coöperate in maintaining the dynamic force of the organism.

Hormotone has a markedly stimulating effect on metabolism and oxidation and causes an increase in mental, nervous and muscular activity. It is a tonic of rare quality.

Formula: Hormotone contains the hormones of the thyroid ($\frac{1}{10}$ gr.), pituitary ($\frac{1}{20}$ gr.), ovary and testis.

Indications: Neurasthenia and all asthenic conditions; impotence, premature senility and the debilities of old age; menstrual disorders and climacteric disturbances; chronic cardiac cases with hypotension, circulatory stasis and cold extremities; convalescent and post-febrile weakness.

Hormotone Without Post-Pituitary should be used instead of the regular formula in high blood-pressure and sthenic or vigorous conditions.

Dosage: One or two tablets three times daily before meals.

Hormotone is put up for physicians' prescriptions in bottles of 100, 500 and 1000 two and a half grain tablets.

LITERATURE UPON REQUEST

G. W. CARNRICK COMPANY

13 Sullivan Street **New York City**

Low Alveolar CO_2 Tension
Low Alkali Reserve
High Hydrogen-ion Acidity of Blood
High Hydrogen-ion Acidity of Urine
Acetone Bodies in the Urine
Air Hunger

CALL for ALKALI

Kalak Water Company
23 City Hall Place, New York

Supply this need and fortify your other medication by prescribing KALAK WATER for your patient.

Principles of Nursing—Brown

Just Ready

Here is a nurse's text that *adheres strictly to the principles of nursing.*

In all departments of education the advantage of carefully graded instruction is now universally accepted, and her years of experience in teaching have emphasized in the author's mind the need of a concise and understandable text-book.

The clinical features are emphasized throughout. Instruction in observing and recording the patient's condition, nursing in various disease conditions, surgical dressings and operating-room technic are fully and carefully explained. A glossary is placed at the end of the book.

12mo, 262 pages, illustrated. By CHARLOTTE A. BROWN, R. N., Superintendent of Nurses, New England Hospital for Women and Children. Cloth, $1.75, net.

Chemistry and Chemical Uranalysis for Nurses—Amoss

New (2d) Edition

This work, which has been most thoroughly revised, gives the nurse that working knowledge of chemistry which increases her value both to the patient and physician. The important measure of feeding the sick is very often left to the nurse. It is obvious that knowledge of chemical composition of foodstuffs and the chemical processes of digestion will better serve her in unusual cases and those presenting metabolic and digestive disturbance. Special attention is called to the very helpful summary at the end of each chapter and to the chapters on Acids and Bases, the Blood, Milk, and Uranalysis. The latter shows how to collect and care for specimens and also gives the standard tests, such as Benedict's, Van Slyke's for Urease, Gmelin's, Jaffe's et al.

12mo, 270 pages. By HAROLD L. AMOSS, M.D., Formerly Chemist Hygienic Laboratory, U. S. Public Health Service; Physiological Chemist U. S. Bureau of Chemistry; Assistant in Preventive Medicine, Harvard Medical School, etc. Cloth, $1.75 net.

706-8-10 Sansom St.
PHILADELPHIA

LEA & FEBIGER
PUBLISHERS

2 W. 45th Street
NEW YORK

Recommending

Neosalvarsan

(NEOARSPHENAMINE--METZ)

The spirocheticide of choice for the general practitioner

NEOSALVARSAN

- Immediately dissolves in room temperature water.
- Can be administered in concentrated solution by means of a 20 to 50 c.c. glass syringe.
- Is remarkably well borne by the patient. Practically no reactions follow.
- Being powerfully potent, produces prompt clinical and serological results.

Dosage IV (0.6 *gram*), $1.50 *each; Dosage VI* (0.9 *gram*) $2.00 *each*

In cartons of 10, 25 and 50 ampules, 10 per cent. discount.

H. A. Metz Laboratories, Inc.

122 HUDSON STREET NEW YORK

THE HOUSE WITH A POLICY

5. Therapeutic Efficiency.

NEW medicinal products in large numbers are brought every year to the attention of physicians. A few of them are of decided value. Many of them are worthless. How is the physician to separate the sheep from the goats? How is he to know what dependence he may place upon a given product?

Realizing the great responsibility which rested upon us, we began in 1902 the organization of a Staff of Medical Co-workers. What does this Staff mean at the present time?

It means that 2400 physicians in the United States are coöperating with us daily in testing out new products. In this group are to be found many of the ablest specialists and general practitioners in the medical profession of America.

A new chemical synthetic, biological product, glandular agent, or pharmaceutical preparation, developed in our research laboratory, is first subjected to thorough animal experimentation, and then we turn the product and the laboratory data over to one group or another of these skilled men. The product is tried out thoroughly at the bedside and in the hospital, and sometimes two or three years of exhaustive experimentation is conducted before we attempt to say whether or not it has justified itself.

These physicians coöperate with us in the interest of medical science. They are not paid for their work, and their names are never used. Our relationship with them is one of supreme confidence on both sides.

If this expert jury decides that a product is valueless, that product is promptly discarded, even though thousands of dollars and years of time may have been spent in its development. If, on the other hand, it is found to be one of great usefulness, then we are prepared to go before the medical profession feeling that we have something which we can offer with every confidence in its therapeutic efficiency.

For many years, therefore, Parke, Davis & Company have never offered a product to the physicians of the world until it has been first subjected to the most grilling tests. Physicians may be sure not only that it has been standardized, not only that it has been made to conform to the highest possible degree of quality, and that the utmost of science has been utilized in its manufacture, but also that its therapeutic value has been demonstrated beyond any question of doubt.

PARKE, DAVIS & COMPANY

SARATOGA SPRINGS

Open the Year Round

RESERVATION ADMINISTERED BY THE CONSERVATION COMMISSION OF THE STATE OF NEW YORK

For Health and Recreation

At Saratoga convalescent patients and those tired and run down from overwork regain health and vigor. The waters—highly supersaturated with carbonic acid gas, rich in chlorides and radio-active—stimulate those functional actions necessary to rapid recuperation.

Saratoga Mineral Baths in therapeutic merit, fully equal and in many ways surpass those of Nauheim, Homburg, Kissingen, Wiesbaden, and other celebrated European Spas.

The State of New York Conservation Commission administers Saratoga Springs and has made many extensive improvements which contribute to it's attractiveness. One of this year's notable achievements is the magnificent new bath house.

The Drinking Waters from the several springs are valuable as laxatives, digestive tonics, diuretics, and chalybeates. Bottling plants are maintained by the Commission, through whom the bottled waters may be ordered.

Two valuable new booklets, giving analyses of the waters and detailed information have been issued for physicians. Free on request.

"Saratoga for Health and Recreation"
"Hydrotherapeutic Treatments at Saratoga Springs"

Address:

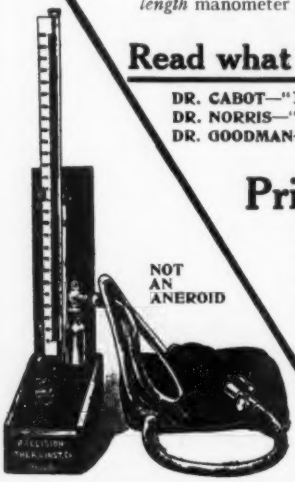
State of New York Conservation Commission

Division of Saratoga Springs, Saratoga Springs, N. Y.

THOUGHTFUL PHYSICIANS are using the

Nicholson Princo Sphygmomanometer

The *folding pocket mercurial* instrument with the *full length* manometer tube and scale graduated in single mm.



Read what they say:

DR. CABOT—"Physical Diagnosis." Pages 107–110
DR. NORRIS—"Blood-Pressure, its Clinical Application." Page 132
DR. GOODMAN—"Blood-Pressure in Medicine and Surgery." Page 56

Price (300 mm.), $24.00

Our little booklet "Blood-Pressure," contains a complete description of this instrument. We'll be glad to send you a copy along with a pamphlet on the Clinical Significance of Diastolic and Pulse Pressure. Free for the asking.

Precision Thermometer & Instrument Co.
1434 Brandywine Street
PHILADELPHIA, PA.

New (2nd) Edition

Applied Anatomy and Kinesiology

KINESIOLOGY includes a study of the principal types of muscular exercise, with inquiry as to how they are performed, how they react on the body, and their relations to the problems of bodily development, bodily efficiency, and the prevention and cure of certain defects and deformities. It is the science of building up health and body. The reaction of work upon the body is not only developmental but mechanical, for it influences the posture of the joints and the shape of the bones. As every one knows, tens of thousands of crippled soldiers were (during the war) and are now being brought back to strength and usefulness largely by the reëducation of muscular movements. Thus such a book becomes valuable to physicians, particularly the orthopedist, while the BRITISH JOURNAL OF TUBERCULOSIS "*commends it to all medical advisers engaged in tuberculosis work.*"

By WILBUR PARDON BOWEN, M.S., Professor of Physical Education, Michigan State Normal College, Ypsilanti, Michigan. Octavo, 334 pages, with 197 engravings. Cloth, $3.50, net.

706-8-10 Sansom St. PHILADELPHIA

LEA & FEBIGER
PUBLISHERS

2 W. 45th Street NEW YORK

Stanolind

Reg. U. S. Pat. Off.

Surgical Wax

A new dressing for burns, granulations and similar lesions.

Manufactured by the Standard Oil Company of Indiana, and guaranteed by them to be free from deleterious matters, and so packed as to insure it against all contamination.

Stanolind Surgical Wax has a sufficiently low melting point so that when fluid the possibility of burning healthy tissue is precluded.

Its correct ductile and plastic features make it adaptable to surface irregularities without breaking.

When properly applied it adheres closely to sound skin, yet separates readily and without pain from denuded surfaces.

Stanolind Surgical Wax when applied in proper thickness maintains a uniform temperature, promoting rapid cell growth, and assisting nature to make repairs quickly.

Stanolind Petrolatum

A New, Highly Refined Product

Vastly superior in color to any other petrolatum heretofore offered.

The Standard Oil Company of Indiana guarantees, without qualification, that no purer, no finer, no more carefully prepared petrolatum can be made.

Stanolind Petrolatum is manufactured in five grades, differing one from the other in color only.

Each color, however, has a definite and fixed place in the requirements of the medical profession.

"Superla White" Stanolind Petrolatum.

"Ivory White" Stanolind Petrolatum.

"Onyx" Stanolind Petrolatum.

"Topaz" Stanolind Petrolatum.

"Amber" Stanolind Petrolatum.

The Standard Oil Company, because of its comprehensive facilities, is enabled to sell Stanolind Petrolatum at unusually low prices.

STANDARD OIL COMPANY

(Indiana)

Manufacturers of Medicinal Products from Petroleum

910 S. Michigan Avenue Chicago, U. S. A.

764

Diarsenol (*Arsphenamine*) Neodiarsenol (*Neoarsphenamine*)

Manufactured under license Federal Trade Commission, Washington

USED BY U. S. GOVERNMENT AND THOUSANDS OF PHYSICIANS AND HOSPITALS THROUGHOUT THE UNITED STATES

DIARSENOL COMPANY, INC.

BUFFALO BOSTON ATLANTA

QUANTITATIVE SUGAR TEST

A convenient and decisive test for determining *the percentage of sugar* in urine.

Price $1.50 for the outfit that will give twenty tests

Sent direct by mail

LISTER BROS., Inc.

OFFICE, 405 LEXINGTON AVENUE
LABORATORY, 50 E. 41st STREET
NEW YORK CITY

LUMB—Systematic Treatment of Gonorrhea

New Work Just Ready

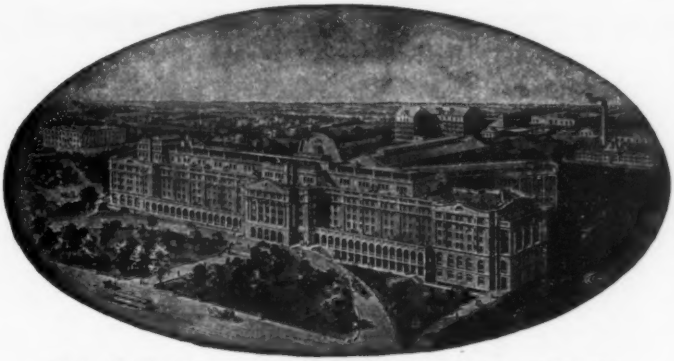
A thoroughly practical hand-book giving the practical details of methods of treatment found most valuable in thousands of cases. Covers Symptoms, Pathology and Bacteriology, Urinalysis, Routine Treatment, Special Treatment (Vaccines, Electro-Chemical, Mercury Compounds), Complications, Chronic Cases, Test of Cure, etc.

12mo, 119 pages. By N. P. L. LUMB, Captain, Royal Army Medical Corps.
Cloth, $1.50, net

706-8-10 Sansom St. PHILADELPHIA

LEA & FEBIGER
PUBLISHERS

2 W. 45th Street NEW YORK



THE BATTLE CREEK SANITARIUM AND HOSPITAL

Established 1866

MEDICAL	OBSTETRICAL	ORTHOPEDIC
NEUROLOGICAL	SURGICAL	RECONSTRUCTIVE

EDUCATIONAL DEPARTMENTS

Training School for Nurses — Normal School of Physical Education

School of Home Economics and Dietetics

Students received on favorable terms. — Registered trained nurses, dietitians and physical directors supplied.

DESCRIPTIVE LITERATURE MAILED FREE UPON REQUEST

THE BATTLE CREEK SANITARIUM

BATTLE CREEK — Box 247 — MICHIGAN

Just off Press—New (7th) Edition of

Egbert's Hygiene and Sanitation

The call has been for concise, up-to-date books giving the modern authoritative practice, particularly as regards Industrial Hygiene. Dr. Egbert has subjected every chapter to the most searching revision and has inserted much new material of considerable value. Especial attention has been given to the chapters on Industrial Hygiene, Military Hygiene and Sewage Disposal, because of their greatly increased importance. The new developments in the biologic treatment of sewage which promise so much, are fully treated.

By SENECA EGBERT, A.M., M.D., Professor of Hygiene, University of Pennsylvania; formerly Dean of the Medico-Chirurgical College, etc. 12mo, 554 pages with 160 engravings and 5 plates. Cloth, $3.00 net.

706-8-10 Sansom St. **PHILADELPHIA** — **LEA & FEBIGER** **PUBLISHERS** — 2 W. 45th Street **NEW YORK**

CORPUS LUTEUM

OVARIAN SUBSTANCE

THYROIDS U. S. P.

SUPRARENAL U. S. P.

SUTURES

DEPENDABLE DERIVATIVES

from the

Animal Field

are only obtainable where selection and control of the raw material are possible; where attention to seasonal variation in glandular activity may be observed and where technical experts control every step in the manufacturing processes.

We emphasize these points because they mean much to you and more to your patients.

Send for our catalogue of Animal Derivatives and have your name put on the mailing list for "The Autacoid and Suture."

THE HOLLISTER-WILSON LABORATORIES

4221-25 So. Western Blvd. CHICAGO, ILLINOIS

8

in

During t
witnessed, r
stration tha
digestive di
was malt su

Eight yea
realized the
laboratory p
satisfactory
equipment

During th
in the new p

MEA

From the
policy has b
AND SUP
ACCOMPA

During th
a small equ
quickly enla
of 50,000 sq
a building
additions to
process, this
become an
community.

We are p
are still no
Mead's Dex

has
in i

We are pro
interest of t
Dextri-Malt
continued su

MEAD

EVA

E
S

IS

8 Years' Progress in Pediatrics

During the past eight years many important advances in infant feeding have been witnessed, not the least of these being the simplification of feeding systems and the demonstration that sugar, not curd, in the infant's diet is responsible for the greatest amount of digestive disturbance, and that the sugar causing the least amount of digestive trouble was malt sugar (maltose-dextrin).

Eight years ago this company, at the request of advanced thinkers in pediatrics, who realized the usefulness of a maltose-dextrin preparation in the diet of infants, sent its first laboratory prepared sample of malt sugar to the New York Post Graduate Hospital. The satisfactory results obtained from this sample led to requests for more samples and soon equipment for manufacturing malt sugar was installed.

During these days these pediatrists for purely scientific reasons evidenced much interest in the new product, and we are indebted to them for naming it

MEAD'S DEXTRI-MALTOSE

From the outset Dextri-Maltose was manufactured for physicians' use exclusively. Our policy has been and will be, LET THE DOCTOR BOTH PRESCRIBE THE PRODUCT AND SUPPLY THE FEEDING DIRECTIONS. NO DIRECTIONS FOR USE ACCOMPANY TRADE PACKAGES.

During the past eight years, starting with a small equipment in one room, which was quickly enlarged to occupy a whole building of 50,000 sq. ft. of floor space, and since then a building of 300,000 sq. ft., with constant additions to equipment and improvements in process, this industry has grown until it has become an institution of importance in our community.

We are proud of this institution, but we are still more proud of the knowledge that Mead's Dextri-Maltose

has filled a want in infant feeding

We are proud of and grateful for the friendly interest of the pediatrists. We are proud that Dextri-Maltose has proved worthy of their continued support.

MEAD JOHNSON & CO.

EVANSVILLE, IND.

3 Forms of MEAD'S DEXTRI-MALTOSE

(No. 1, No. 2 and No. 3)

No. 1. With Sodium Chloride, 2%.—For general use in the diet of infants. It may be substituted in the same proportion for either cane or milk sugar in any good system of feeding.

No. 2. Unsalted.—Prepared for those physicians who prefer to make their own salt additions. Also of special value in the diet of adult invalids.

No. 3. With Potassium Carbonate, 2%.—Valuable where constipation is present. Potassium carbonate acts as a corrective by softening the fecal matter.

The Management of an Infant's Diet

In extreme emaciation, which is a characteristic symptom of conditions commonly known as

Malnutrition, Marasmus or Atrophy

it is difficult to give fat in sufficient amounts to satisfy the nutritive needs; therefore, it is necessary to meet this emergency by substituting some other energy-giving food element. Carbohydrates in the form of maltose and dextrins in the proportion that is found in

MELLIN'S FOOD

are especially adapted to the requirements, for such carbohydrates are readily assimilated and at once furnish heat and energy so greatly needed by these poorly nourished infants.

The method of preparing the diet and suggestions for meeting individual conditions sent to physicians upon request.

MELLIN'S FOOD COMPANY, BOSTON, MASS.

THE GLEN SPRINGS

On Seneca Lake
OPEN ALL YEAR

WATKINS, N. Y.

WM. E. LEFFINGWELL
President

A MINERAL SPRINGS HEALTH RESORT AND HOTEL

IN THE HEART OF THE FINGER LAKES REGION

The Pioneer American "Cure" for Heart Disorders

The only place in this country where the Nauheim Baths for Heart and Circulatory Disorders are given with a Natural Calcium Chloride Brine

Hydrotherapy, Electrotherapy, Massage

The treatments under the direction of physicians are particularly adapted to HEART DISEASE, Circulatory, Kidney, Nutritional and Nervous Disorders, Rheumatism, Gout and Obesity. Splendid facilities for sports and recreations. FINE GOLF.

Physicians are requested to send for literature detailing treatments, Mineral Springs analyses and other particulars.